MERCURY'S MOST POWERFUL OUTBOARD ENGINE EVER p62

BOATING

POWERBOAT MAGAZINE

7 REASONS YOU NEED RADAR p76

HOLDING POWER

12 ANCHORS PUT TO THE TEST p64

THE BIGGEST BOSTON WHALER EVER! **420 OUTRAGE**

CERTIFIED BOAT TESTS

BOSTON WHALER 420 OUTRAGE
OUTERLIMITS SL 41
NOVA 39 SPORT
NOR-TECH 390 OPEN
CALCUTTA 263
BAYLINER ELEMENT XL

4 WAYS TO HANG FENDERS p38

BURGLAR-PROOF YOUR BOAT p88

BONDING AGENT

Meet the next generation of deck boating: the Sea Ray 270 Sundeck Outboard.

Innovative cockpit design and clever seating solutions help conversation flow effortlessly, so family bonds strengthen naturally. Breakthroughs like the No-Tradeoff Transom™ encourage more enjoyable interaction with the water and everyone in it. And thanks to SURPA5S, Sea Ray's comprehensive 5-year factory warranty, peace of mind comes standard. Sure, there's ample space to spread out. And yet somehow you'll wind up getting closer.

WWW.SEARAY.COM


Sea Ray
LAUNCH INTO LIVING

The COBALT 220

Because nowhere in your life do you accept mediocrity.

Design Your Dream at www.CobaltBoats.com.

COBALT BOATS
Compromise Nothing

10 SERIES BR SERIES A SERIES SD SERIES 3 SERIES WSS WATER SPORTS SERIES

The 10 Series boats come from a full line of hand-crafted Cobalt models, one of which is precisely matched to your wishes.

BOATING
JULY/AUGUST 2015

PAGE 70

82

FEATURES

64 Holding Power
We put 12 anchors to the test to see how they hold up.
BY CAPT. JOHN PAGE WILLIAMS

70 How Marine Oil Is Made
You won't believe what it goes through to keep our engines lubricated.
BY CHARLES PLUEDDEMAN

76 Superhero Powers
Seven things radar does better than other marine electronics
BY RICHARD JOHNSON

Departments

12 Making Waves
- Meet Hailey Parker, wakesurfer.
- We compare exhaust risers.
- Do you know how to poker run?
- Five first mates to avoid
- The pocket jump-starter

28 The Boat Doctor
- Mick Hannock saves the day for boaters yet again.
- Install electric trim tabs.
- How to hang your fenders
- All about washdown systems
- Prepare for the next hurricane.

62 Motorhead
- Mercury Racing's 400S

82 Electronics
- Simrad's Halo radar
- Spotting birds with radar
- Ken's tips on how to protect against equipment failures

84 Short Casts
- Three trends in fishing gear
- Night-fishing docks and bridges
- Raymarine eS Series by FLIR

86 Short Casts Special
- A jig to cut rod holder holes

88 BoatingLAB
- We test vessel security options.

Tests

Boston Whaler
420 Outrage
This flagship center-console can carry the load in style and with a really sweet attitude. ***p. 46***

Outerlimits
SL 41
Here's what you get when big engines get paired with a hull engineered for top performance. ***p. 50***

ALSO:

- **NOR-TECH** 390 SPORT OPEN p. 54
- **BAYLINER** ELEMENT XL p. 56
- **NOVA** 39 SPORT p. 58
- **CALCUTTA** 263 p. 60

Columns

10 Editorial
Did you know that you can still drown while wearing a life jacket?

26 Seamanship
Make everyone part of the crew.

106 Following Seas
The forgotten genius of boating

ON THE COVER
The Boston Whaler 420 Outrage is the largest Whaler ever built. Photo: Bill Doster

PHOTOS: (CLOCKWISE FROM TOP LEFT) MICHAEL SCHOENECKER, COURTESY SIMRAD, MEDIA ONE 7, BILL DOSTER

A CALLING THAT RUNS IMPOSSIBLY DEEP

GUTS·GLORY

RAM

BEST-IN-CLASS 29 HWY MPG
5-YR 100K-MI POWERTRAIN WARRANTY

More people are driving Ram Trucks than ever before

1) Standard pickup class. EPA est. 21 city/29 highway MPG based on EcoDiesel V6 4x2 quad cab HFE model. Limited crew cab EcoDiesel 4x2 shown with EPA est. 20 city/28 highway MPG. Actual results may vary. 2) See dealer for a copy of the powertrain limited warranty. 3) Based on excluding total sales of calendar years 2009 through 2015. Ram is a registered trademark of FCA US LLC.

BOATING

PEFC
This product is from sustainably managed forests and controlled sources.

Alliance for Audited Media

Printed in the USA

FOR CUSTOMER SERVICE AND SUBSCRIPTION QUESTIONS,
such as renewals, address changes, email preferences, billing and account status, go to boatingmag.com/cs. You can also email BGMcustserv@cdsfulfillment.com. In the U.S. call toll free 800-289-0399 (outside the U.S. call 515-237-3697) or write to *Boating* Magazine, PO Box 6364, Harlan, IA 51593. Retail Single Copy Sales: ProCirc Retail Solutions Group, Tony DiBisceglie.

HARRIS

INTRODUCING THE HARRIS CROWNE

NMMA INNOVATIVE ACHIEVEMENT AWARD WINNER

Contact your nearest dealer by using the dealer locator at harrispontoonboats.com or download the ebrochure at harrisboats.com/brochures

Editorial

By Kevin Falvey

The Pillars of Boating Safety

IT'S UP TO YOU TO BUILD OUT A PERSONALIZED SAFETY PLAN.

IN A RECENT BLOG POST, I called out several mandates by the United States Coast Guard, the United States Power Squadrons, the National Association of State Boating Law Administrators and other agencies as the "pillars of boating safety." Specifically, these pillars include wearing a life jacket, not drinking while operating a boat, and taking a boating safety course.

Now, because these items were identified as pillars doesn't mean that's all that a boater needs to do to keep his family and friends safe. These three items just create a solid framework within which to house any given boater's personal boating-safety program. Let's look at life-jacket wear through the lens of a recent tragedy at Dauphin Island, Alabama, wherein participants of a sailboat regatta drowned during a squall. Five bodies were recovered and one person was still listed as missing at the time of this writing. Reportedly, some of the dead were wearing life jackets.

How could this be?

One reason might be that the life jackets were not of the proper size or type. Or perhaps some victims had not fastened the straps snug and proper. Then there is the obscure, but very real, phenomenon of "mouth immersions." Boating first covered mouth immersions in January 2005.

According to documents produced by the Coast Guard and distributed by the Power Squadrons, mouth immersions are what happen when waves slapping against a person's face while they are floating in a life jacket deposit a bit of water into the person's mouth and nose. Some of this water may make its way to the lungs. Repeated mouth immersions, over a period of time, could cause a person wearing a properly sized, properly fitted and properly fastened life jacket to drown.

In fact, in rough seas, "airway freeboard" is a chief concern for survival, according to studies conducted by the Coast Guard and other agencies. This means the higher you can keep your nose and mouth above the water, the better chance you have of survival. So, besides being aware of mouth immersions, we can proactively select an appropriate life jacket — one with more buoyancy — when our cruising waters are likely to be rough.

In fact, in rough seas, "airway freeboard" is a chief concern for survival, according to studies conducted by the Coast Guard and other agencies.

Mouth immersions. Would you have ever thought about them? Going out on a boat is a wonderful experience. Please remember that part of the reason for our wonderment while boating stems from leaving land behind. Water is not our element, and therein lies a charm.

Stay safe.

Kevin Falvey, Editor-in-Chief
editor@boatingmag.com

A DIFFERENT KIND OF COMPANY, A DIFFERENT KIND OF BOAT.

In 1960, Jim Bryant and his family began building handcrafted boats in East Tennessee, putting their heart and soul into every one. It was a level of pride and commitment to quality that, even then, was unheard of. And now, more than half a century later, it's still the standard to which every Bryant Boat is held.

Today, Bryant is run by some of the industry's most respected and storied boat builders – people who have revolutionized water sports and recreational boating at some of the world's top marine manufacturers. This team was attracted to Bryant because of its rich heritage of focusing on building amazing boats. We're boaters ourselves. We live the lifestyle, and have an innate understanding of our products and our sport. That's why we have a reputation for building "boaters' boats."

Thanks for taking a close look at Bryant. We're here to help you make the most informed decision possible in your next boat purchase. Please feel free to speak with any of our dealer partners or come tour our factory right here in Sweetwater, Tennessee.

I BELIEVE THAT ONCE YOU SEE HOW THEY ARE BUILT, ONLY A BRYANT WILL DO.

JOHN DORTON
CEO – Bryant Boats

For factory tour,
call Ben at 423-337-0344
www.bryantboats.com

Bryant
Not just a boat. A Bryant.

Making Waves

ON BOARD WITH ...

Hailey Parker
Competitive Wakesurfer

We met Hailey Parker at the last Miami Boat Show, where she served as the surfer's voice for Volvo Penta's new Forward Drive. Plus, she helped me catch the wave behind a new Four Winns TS222. Here's what she had to say about the growing sport of wakesurfing.
— Pete McDonald

MORE ONLINE!

To read the full interview online, go to boatingmag.com/haileyparker.

How long have you been wakesurfing?
About two years but it really happened all of a sudden. One summer we were out messing around with wakesurfing, and by the next March, I was training for a competition. I was 100 percent addicted.

What inspired you to try it?
Growing up on the Lynnhaven River in Virginia Beach, Virginia, we would grab old surfboards and go behind our Mako boat and "free-surf" [farther behind the boat and with a tow rope]. When my dad bought a lake house he got a boat that could create a synthetic wave, and we were hooked.

How does it compare to wakeboarding?
I think the only thing that wakeboarding and wakesurfing have in common is it's the same procedure to get up on the board. Once my family figured out how much more fun wakesurfing is, we pretty much stopped wakeboarding altogether.

How about traditional surfing (if you've tried it)?
Every summer as a kid we would have a rental house on the Outer Banks, North Carolina, and we would ocean surf. It's definitely a different style of surfing, but you have the luxury of never going into the whitewash or waiting for a set.

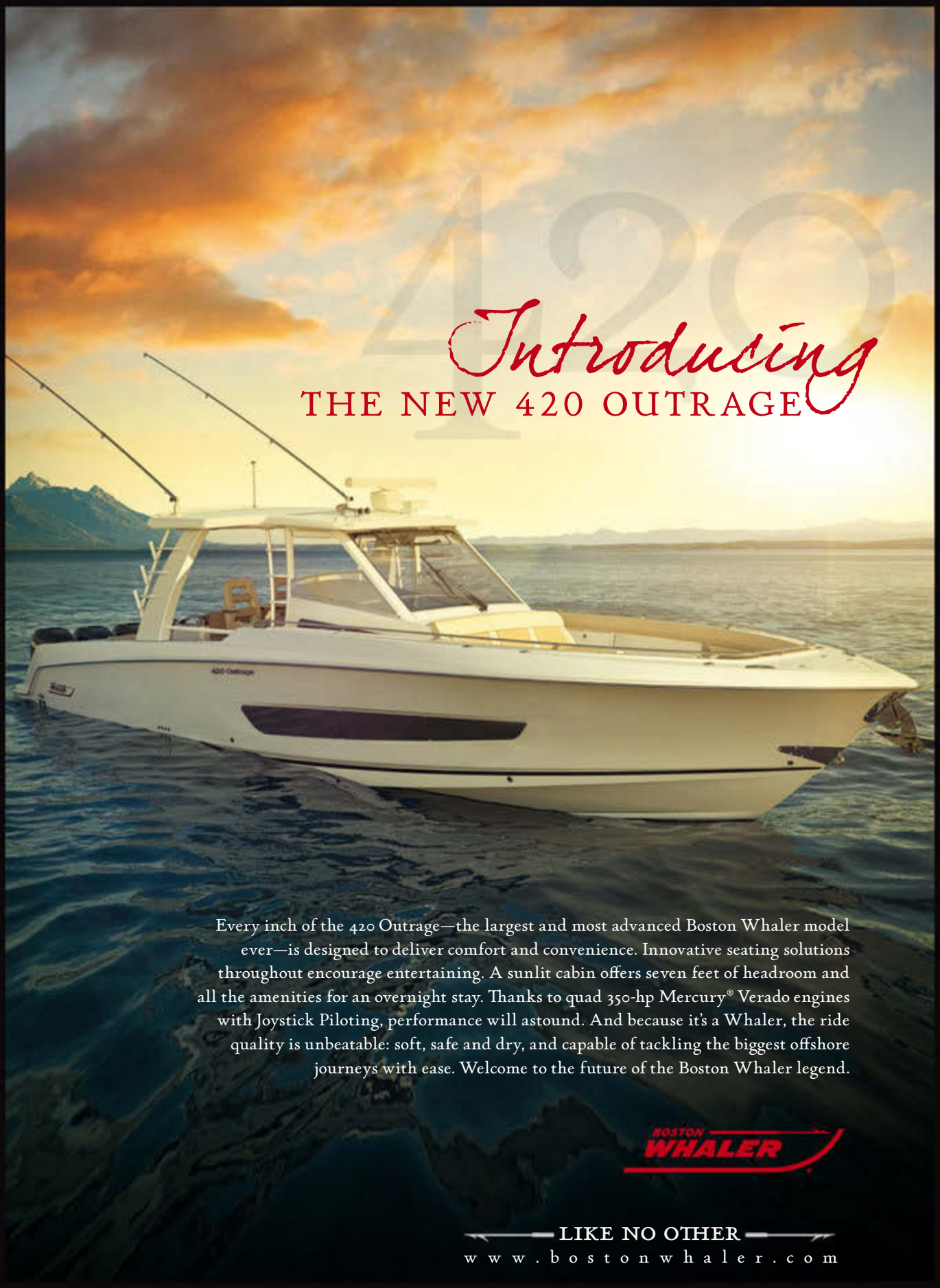
How easy is it to get started in the sport?
It's an extremely easy sport to get involved in, and once you get that feeling of getting up you can do it all.

How long did it take you to reach a competitive level?
I've always just surfed for fun, but my dad asked me if I wanted to be serious about wakesurfing because I was getting good at such a fast rate. He bought a new boat with the tab system, and we started training in March of last year. I was competing two months later in Phoenix, Arizona, and took home first place.

Do you have plans to turn professional?
I absolutely will be training, entering several tournaments and working to move up in divisions, but as of right now I'm just hoping to move up a division and reach the podium at Worlds this year.

What would you tell kids and families interested in trying the sport?
Once you try wakesurfing you know that you will be completely addicted, and the best thing about this sport is anyone at any age can do it. It's 100 percent a family affair.

PHOTO: COURTESY VOLVO PENTA


Introducing
THE NEW 420 OUTRAGE
Every inch of the 420 Outrage—the largest and most advanced Boston Whaler model ever—is designed to deliver comfort and convenience. Innovative seating solutions throughout encourage entertaining. A sunlit cabin offers seven feet of headroom and all the amenities for an overnight stay. Thanks to quad 350-hp Mercury® Verado engines with Joystick Piloting, performance will astound. And because it's a Whaler, the ride quality is unbeatable: soft, safe and dry, and capable of tackling the biggest offshore journeys with ease. Welcome to the future of the Boston Whaler legend.
BOSTON WHALER
LIKE NO OTHER
www.bostonwhaler.com

FOR COMPARISON'S SAKE

Sound-Reducing Exhaust Tips

Exhaust noise will always be a hot-button issue for fans of and detractors of high-performance boats. One of the best ways to reduce the sounds being produced by your boat's engine(s) is to install exhaust tips with integral mufflers. They are less costly than switchable diverters, which are not allowed in some states, and cause minimal power loss from back pressure. — *Eric Colby*

Custom Marine Inc.
XTS Exhaust Tips

THE HUSH: CMI's XTS tips use water as the noise-deadening medium. They are fabricated out of marine grade 316L stainless steel and are available to install on a boat's transom or as a silencer that clamps to your boat's existing tips. The manufacturer says the tips are passivated to minimize rust streaks on a boat's transom.

THE NOISE: Because they use water to deaden the noise, they could be more susceptible to corrosion issues if they're used exclusively in salt water.

$595 per pair;
custommarine.com

IMCO Marine
Flange Mount Gatlin Muffler

THE HUSH: This muffler has rounded tips for a cool look. It has no moving parts but uses internal baffling to reduce noise without restricting horsepower. Constructed from stainless steel, this swim-step-style model mounts to the boat's transom. IMCO sells a clamp-on style Gatlin muffler and Gatlin inserts as well.

THE NOISE: The tips are the most expensive of the three. For a twin-engine boat, you're spending more than 2 grand to quiet it.

$1,054 per pair;
imcomarine.com

Gibson
Bullet Marine Mufflers

THE HUSH: Gibson's Bullet marine mufflers have been tested on engines up to 1,200 hp with minimal power loss and are said to reduce noise levels to as low as 88 decibels. The straight-through design uses water to dampen the noise, and the stainless-steel muffling tips can be mounted on the transom or used as a clamp-on model.

THE NOISE: The tapered end design could make it tough to mount flappers on this muffler; there's corrosion potential in salt water.

$864.35 per pair;
gibsonmarine.com

317.596
FASTEST SPEED, IN MILES PER HOUR, RECORDED BY A BOAT; SET BY *SPIRIT OF AUSTRALIA* IN 1978

102.256
FIRST BOAT SPEED RECORD, IN MILES PER HOUR, OVER 100; SET BY GAR WOOD IN 1931

PHOTOS: (FROM TOP LEFT) COURTESY CUSTOM MARINE; COURTESY IMCO MARINE; COURTESY GIBSON; ILLUSTRATION: ISTOCKPHOTO.COM

Command and **Control**

Less is **MORE**

The M400BB includes the HM-195B/SW, (COMMANDMICIV™). Available in black and super white.

www.icomamerica.com/marine

M400BB: VHF Black Box Transceiver

Keep your helm clutter-free and control communications from the palm of your hand. Easily install the M400BB in an out-of-sight location.

- Bundled with the Popular COMMANDMICIV™
- Built-in Class D DSC
- Intuitive User Interface
- Active Noise Cancelling
- 10W Loud Audio with PA and Foghorn

Simply the Best.

ICOM

Captain's Test

Poker Run Etiquette

We all know poker runs can be amazing showcases of power and speed, but do you know the rules and how to conduct yourself so the card sharks don't chew you up? Take this quiz and find out. – *Eric Colby*

(Answers on p. 20)

PHOTO: LAKE RACER LLC

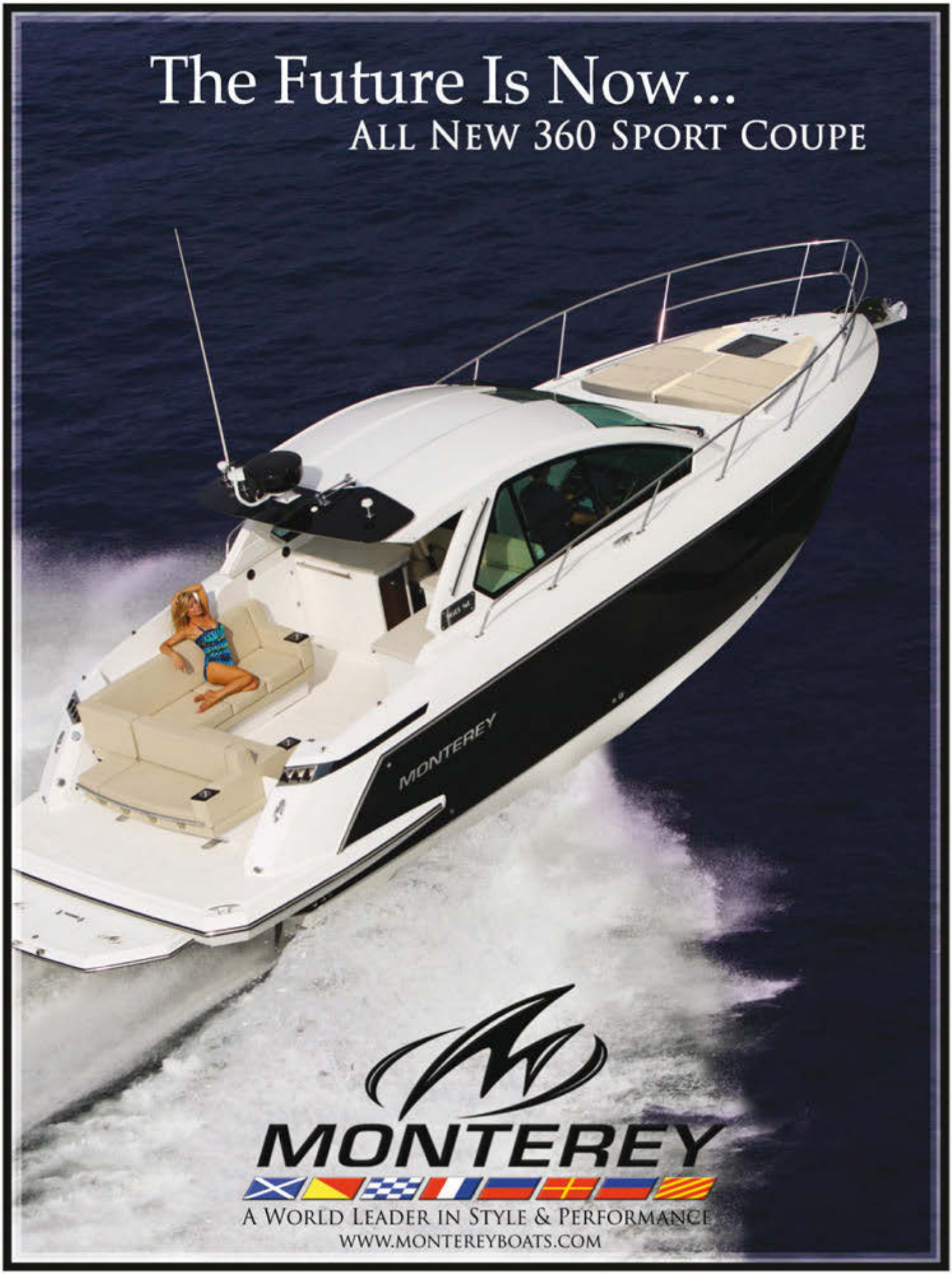
1 Is a poker run a race?
A. Yes
B. No

2 During a poker run, who has to wear approved life jackets?
A. The driver and throttle man
B. Just the driver
C. Everyone on board the boat
D. The driver and any kids, according to state law for the event

3 What is prevented at every poker run around the country?
A. Passing the pace boat
B. Cutting off another boat in the event
C. Washing down another boat with your rooster tail
D. Drinking alcohol during the event

4 Many poker runs have signal flags that the organizers fly to alert participants to various situations. What does a yellow flag usually mean?
A. Slow down and proceed with caution.
B. Come off plane and proceed at no-wake speed.
C. Stop and call the organizers on the VHF radio channel you were given in your information packet.
D. Keep going and watch out for a situation ahead.

5 A faster boat is coming up on your stern. What should you do?
A. Pull out of the way.
B. Maintain your position and let him pass.
C. Accelerate and race him.
D. All of the above


The Future Is Now...
ALL NEW 360 SPORT COUPE
MONTEREY
MONTEREY
A WORLD LEADER IN STYLE & PERFORMANCE
WWW.MONTEREYBOATS.COM

Charge and Go

Nothing sucks worse than a boat with a dead battery, except when there's a stranded boater on board with a dead smartphone too. So carrying around the compact Weego JS6 standard jump-starter battery pack seems like a really smart idea.

The main unit is about the size of a smartphone, so it can easily slide into your pocket or take up minimal space in the onboard glove box or stowage bin. It also comes with alligator clips, 12- and 120-volt power cords, and a USB adapter for smartphone connections. Fully charged, this lithium-ion battery pack is powerful enough to jump-start a car or boat with up to a 4.6-liter gasoline engine or 2.4-liter diesel engine.

That's a nice fallback to have on hand in the rare times you need it, but on a day-to-day basis it's great for keeping your smartphone alive. So many times on the water, my phone battery runs dry as I use it to check navigation, check weather and take so many awesome pictures. The Weego has a long service life before *it* needs recharging itself; I've plugged my phone in countless times without draining down the Weego. In a pinch, it also works as an LED flashlight. $99.99; myweego.com — *Pete McDonald*

Night Sight

Forget thermal imagining; a team of self-described medical tinkerers have created eyedrops that enhance night vision, and we wonder, are these guys boaters? Who else would want to see in the dark? Turns out scientists do too. "Medicine focuses on bringing people back to baseline," said Gabriel Licina, a molecular biologist with the group Science for the Masses (scienceforthemasses.org), which makes the drops. "We like to see what happens when those treatments are given to healthy people."

The drops contain Chlorin e6, a chemical in the eyes of deep-ocean fish that shows promise for people with night blindness. Licina tried them himself; while he couldn't see as if using commercial night vision gear, his vision improved. "Dark became dim. I could definitely see better," he said — verifiably better in nighttime tests at ranges from 10 to 50 meters (33 to 164 feet).

Enhanced night vision kicks in an hour after taking the drops and fades four hours later with no measurable side effects the next morning. Don't expect to buy night vision drops any time soon, though. If and when they become available, we're guessing that boaters will be among the first to sign up for them. — *Capt. Vincent Daniello*

PHOTOS: (FROM TOP) COURTESY WEEGO, ISTOCKPHOTO.COM

NO ONE LOOKS BACK ON THEIR LIFE AND SAYS, "I SHOULD HAVE SPENT LESS TIME ON THE WATER."

FIND YOUR ESCAPE.

TTT SERIES

ESCAPE by LARSON

LARSONESCAPE.COM

RT SERIES

Pack Ice

No matter how much dedicated space you have on board for ice and things that need to be chilled, there's never enough. Now, thanks to the IceMule, you can strap some extra chilled refreshments on your back. The IceMule large classic cooler is essentially a waterproof dry bag that rolls up for easy stowage when not in use. The difference is it features an air valve to add a layer of air insulation that helps keep up to 18 12-ounce cans chilled on ice.

Manufacturer instructions suggest you put the contents into the bag first and then cover them on top with ice. Then close the top using the trifold sealing system typically found on dry bags. Next, open the air valve, which resembles that of a beach ball, and puff in a layer of air. I found the IceMule worked best with a dozen cans and a layer of ice, maintaining a waterproof seal and holding ice for 24 hours when properly sealed. A shoulder strap allows you to tote it hands-free.

When you're done, empty the bag and pull the air valve to deflate it; then roll it up and stow it in its sack. While it doesn't have the capacity to bring refreshments for a big crew, the IceMule is great for bringing aboard small boats as well as personal watercraft and kayaks. $69.95; icemulecooler.com
— Pete McDonald

Senior Moments

Memory going? Tough time pulling the tab on your Bud Light? Don't let getting older get to you ... especially when it comes to staying aboard. Here are some tips on how to make boating easier as you get older. *— Joe Friedman*

BUDDY UP Forget the solo trips and take an able-bodied friend along to help with anchoring, docking or landing the big one.

GET COMFORTABLE Add on the TV or microwave. Splurge on new soft cushions or a new captain's chair. Be your body's best friend.

SPREAD THE WEALTH Pay someone else to handle spring maintenance, after-cruise cleanups and engine servicing. It's easier and gives you more time to enjoy.

ANCHORS AWAY Anchors get heavy as soon as they leave the water, especially with 6 to 8 feet of chain. Get a windlass to do the work.

CHECK, PLEASE Pilots use checklists for every flight. They force a routine and remind you to open/close/shut off/stow systems and gear.

THRUSTERS Docking becomes a no-brainer, making maneuvering like child's play. Speaking of, get a joystick system so that your grandkids can dock the boat too.

Captain's Test

(ANSWERS FROM P. 16)

1 B. Most event organizers have done away with things like green flags.
2 C. Most events require that all passengers wear life jackets, and many require a performance-style model with leg straps.
3 D. While all the others are frowned upon, all drinking on a boat during a poker run is a no-no.
4 A. You still want to double-check with the event in which you're participating.
5 B. Don't do anything erratic. That will throw off the other boaters around you.

PHOTOS: (FROM TOP) COURTESY ICEMULE, ISTOCKPHOTO.COM

Introducing new STA-BIL® 360° MARINE, the only fuel treatment to emit a revolutionary vapor technology that rises above the fuel line to protect your engine where others before it can't. Use it with every fill up to help keep your engine running cleaner, leaner, smoother and stronger than ever. **The next level of engine performance is in the vapor.**

5 THINGS ➔ FIVE FIRST MATE TYPES TO AVOID

ILLUSTRATIONS: COLIN HAYES

AS BIG AS YOUR ADVENTURE

WITH ITS 9-INCH TOUCH SCREEN AND COUNTLESS FEATURES, THE X009-GM2 GIVES YOU THE FREEDOM TO TAKE YOUR DASH BEYOND FACTORY.

The 9-inch screen is 89% larger than a standard factory radio and 55% larger than a standard aftermarket screen.

View alerts like tire pressure and door status, plus keep your favorite factory controls such as OnStar® voice commands and Bluetooth® hands-free calling.

The X009-GM2 is compatible with a rear view camera (sold separately), for ease when hitching and confidence when towing.

Your truck deserves the ultimate dash upgrade. The X009-GM2 Restyle Dash System has a large 9-inch screen that is the hub for your entertainment and information needs. Use it with a separate rear view camera for easy hitching and to monitor your trailer while driving. Let your adventures start with Alpine.

Shown here, X009-GM2 for:

2007-2013 Chevrolet*
Silverado
2500 HD
3500 HD

2007-2013 GMC*
Sierra
2500 HD
3500 HD

ALPINE
Driving Mobile Media Innovation

The X009 and custom dash kits are also available for:
Select Ford F-150* trucks, Ram* trucks, Toyota Tundra*, Jeep Wrangler*

ALPINE RESTYLE

www.alpine-usa.com/boating

Online This Month

Sometimes we all have a need for speed, and we're going to honor that this month with some fast and furious boating content. 1 Get all the high-performance boat reviews and insider information you need on our website at boatingmag.com/high-performance. 2 Or sign up for our performance e-newsletter at boatingmag.com/newsletter. 3 If you want to go fast on the water, you should learn how to do it safely and correctly. Visit boatingmag.com/safe-boating-high-speeds.

PHOTOS: COURTESY NOR-TECH HI-PERFORMANCE BOATS (FAR LEFT), COURTESY *MISS GEICO* RACING (LEFT)

NEVER FORGET THE GO IN GONE FISHING.

Bill Dance knows that whether you're competing in a tournament or simply wetting a line with friends, you want to get to your spot in a hurry. He also knows he can count on Mystik® Lubricants. You can too. Our custom-formulated marine engine oils and grease provide the uncompromising OEM performance and corrosion protection you need to experience Lubrication Domination.® For exclusive videos and content from Bill, visit ***Facebook.com/MystikLubes*** *or* ***MYSTIKLUBES.COM.***

VIDEO *Scan to see what it's like to hop in the boat and go fishing with Bill Dance*

BILL DANCE
LEGENDARY FISHERMAN

Seamanship

By Kevin Falvey

Assign a Task

A BUSY CREW MAKES A SAFER BOAT.

IT WAS A TEXTBOOK APPROACH IN CHALLENGING, THOUGH NOT HORRIFIC, CONDITIONS. All I needed to do was drop the control into neutral, cut the wheel toward the dock, and then deliver a final short burst of reverse. The foregoing would have resulted in us coming side-to so gently that an egg placed between the boat and the dock may not have cracked, this despite the brisk onshore wind.

Well, maybe it wasn't that textbook, but it was good, I tell you, darn good.

But a smooth landing never happened. Instead, my mate that day, an old friend I hadn't seen in a while, ended up stuck, as though secured with Velcro, to a splintery piling by his fluffy sweater. He'd jumped up to fend off, without being asked, on the theory that I was going to bang the dock and so needed his help. When I applied the aforementioned reverse and the bow swung out, he was caught unprepared. So he hugged the pole so as not to take a swim. This, of course, necessitated my putting the boat into forward gear lickety-split, before the distance exceeded his 5-foot-11-inch height that was now stretched between my bow rail and the sticky piling.

Yeah. It was one of those.

Now, the main thing isn't my embarrassment at having ended up looking like a Gilligan while docking. (OK, it's a little important.) Instead, two things are key. First, no one got hurt. Second, no boats were damaged in the making of that docking attempt. On top of everything, it all could have been avoided had I only stuck to my longstanding plan of always assigning crew aboard *Breakaway* a job of some sort.

For my daughters, I assign specific jobs so that they can learn boating and seamanship and experience the personal satisfaction of responsibility and completing a job well done. For adults who regularly join my wife and me, I have assigned regular jobs. Part of this is that friends are going to help anyway, so if they want to clean, show them where the bucket and brush are. In addition to personal growth, assigning tasks like this makes everyone feel a part of a team, and everyone is more familiar with the boat.

Do not neglect the occasional guest, though. Treat him or her like crew too. All too often, such guests will do as my friend did: help when none is needed and muck things up, perhaps getting hurt in the process. These folks' hearts are in the right place, but if you have never fended off a boat, you may get hurt.

There's a learning curve involved with being a deckhand, just like anything else. When assigning a task to a newbie, be clear and specific. Hand them a line or a fender, tell them exactly where to sit and wait, and make sure they understand that they are not to jump the gun. You may not use the words *wait for my command*, but that is what they need to understand. They also need to understand that you may not need them at all, but that having them there at the ready will definitely ease your burden.

So for their own safety, the safety of others and your peace of mind, give each member of your crew a job on board.

It's great for camaraderie and, I believe, will pay dividends should there ever be an emergency.

QUICK TIP

Instruct crew using boathooks to reach in the direction of the boat's motion. Reaching "behind" may result in being pulled overboard.

ILLUSTRATION: TIM BOWER

EVERY BOAT NEEDS A PROTECTOR.

PROGRESSIVE

1.800.PROGRESSIVE / PROGRESSIVE.COM

The Boat Doctor

Q&A

By Michael "Mick" Hannock

ASK THE MASSES Go to boatingmag.com/forums to ask fellow boaters your questions, or to answer theirs.

Blowby

[**Q**] Hello, Doctor. I just noticed that there is a lot of oil accumulation in the foam air filter of my 2008 Mercury 115 FourStroke outboard. The filter is just soaked in oil (I've attached a picture). In the past, this filter has always been bone-dry. Where is the oil coming from? Can just replacing the air filter take care of the problem, or is there more to it? Thank you.

GREG GALUBA
Antioch, Illinois

[**A**] That is too much oil. Excessive "blowby" of oil is most likely caused by a blocked or restricted crankcase ventilation system. Check those hoses. You should procure a service manual to identify and locate those specific to your engine. That's a relatively cheap and easy fix — if that is the problem.

If not that, it could be that your piston rings are not sealing. It would be best to perform a leak-down test to determine whether the engine's piston rings are sealing properly. If you're not familiar with, or comfortable, performing this task, seek a certified Mercury technician.

Milk Shake

[**Q**] I have a 2003 Honda 130 hp four-stroke outboard with about 500 hours on it. I do most of the simple maintenance myself (engine and gear oil, plugs, etc.). For bigger stuff, I trust the pros at my local Honda dealer.

A couple of years ago I drained the gear oil at the end of the season, and it came out looking like mustard. I suspected water in the oil and took it to my dealer. He checked it out and could find no leaks, although he had trouble getting the drain plug out. He replaced the bolt/seal on the drain and fill plugs, and filled it with new oil. The next year, same deal. Not wanting to incur the dealer cost again with no appreciable solution, I changed the oil myself to give it another try. This spring I drained the oil, and the picture (below) shows the result — it's still yellow.

Last year I did not flush the lower unit with clean oil. I just drained and refilled it. This year I noticed that the yellow oil kept draining out, even as I filled it with new oil. Is it possible that there is just residual water in the lower unit from the initial plug leak that keeps ruining the oil each year? This time I flushed the lower unit with oil until almost no yellow oil was draining out (took several quarts) before I filled it. Do you think that will do the trick?

PHOTOS: (FROM TOP LEFT) COURTESY GREG GALUBA, COURTESY JIM SOUKUP

JIM SOUKUP
Auburn, New Hampshire

[**A**] Jim, in a location such as yours, wherein the gear-case lube undergoes vast daily and seasonal temperature changes,

Rx

Periodically check electronic connections for corrosion. Remove antenna, and power and transducer cables, and examine the cables' fitting, as well as the device's port. Clean mildly corroded 'ducer and antenna connections with a nail file, and then douse with a shot of silicone spray — but don't lube memory-card slots. Instead, simply wipe them clean with a swatch of microfiber cloth wrapped on a Popsicle stick. — *Kevin Falvey*

THE NEW CARVER C43 COUPE.

DESIGN INNOVATION YOU CAN CLEARLY SEE.

The innovative design of the new C43 Coupe is getting lots of attention. Its single-level salon offers a seamless indoor-outdoor living space made especially for relaxed entertaining. And with more room throughout the boat, its well-appointed galley and comfortable two-stateroom, two-head layout make cruising with family and friends a pure pleasure. Turning heads wherever you go is just an added bonus.

CARVER
YACHTS
See The Difference.

See the complete line at carveryachts.com

boaters will almost always find some water in the oil. This may be evidenced either by a mild milkiness overall or by a small amount of clear water coming out before what looks like used, brownish, but not cloudy, oil. What your picture shows is much more serious.

Your engine's gear case needs to be pressure-tested. It's likely that the propeller-shaft seals are shot. This is an advanced DIY project, one that our West Coast and electronics editor, Jim Hendricks, recently wrote about in detail. See boatingmag.com/how-to/replacing-seals-prop-shafts. Good luck.

Blisters

[**Q**] Hi, Boat Doctor. I have an older (1975) ex-commercial, all-fiberglass, 7-ton fishing boat on which osmosis has caused severe blistering of its top gunwale surface (the hull and decks are fine). I am aware of how to repair the upper gunwale surface, but the gunwales were originally formed with wood two-by-fours and were surrounded with very thick fiberglass. While drilling holes to mount a Scotty pedestal, I observed that the two-by-fours had turned to mush, which was also very moist and warm. This wet-pulp condition in itself does not concern me because the fiberglass is very thick and the osmosis is only on the top surface. It has occurred to me that it would reduce future blistering if I could reduce the pressure that may be within the gunwales. If I just drill holes in the underside of the gunwales, it will allow even more salty air within and most likely result in delamination of the otherwise good fiberglass.

I have looked for, but been unable to find, anyone who sells or manufactures stainless-steel, one-way pressure valves in the 1- to 5-pound pressure range, which I believe should let the pressure out and keep most new moisture out. Maybe I am worrying too much; maybe there is no pressure buildup if the two-by-fours are already dysfunctional. Is this a solution to future blistering or should I just install vinyl tape?

Thank you in advance, Boat Doctor, for any help you can provide.

TERRY D. WELTY, CPA (RETIRED)
Via email

[**A**] If you repair the blisters, they will return. The waterlogged wood core has to go. Water trapped in an anaerobic environment combines with many formulations of 1970s vintage polyester resin and creates an acidic mix that will continue to attack the laminate. You indicate a "thick laminate." It may be that your deck is stiff enough without the core. It may not be stiff enough. In any case, and bearing in mind that I have not actually seen the boat, I would recommend you hire a certified marine surveyor to deliver you a "suitability for service" report. This way you can be assured that you and your crew are safe afloat.

Next, I would recommend one of the following two courses of action:

1. Remove the deck, grind out the core from the bottom, and recore and then reinstall the deck.
2. Perform cosmetic blister repair as required; basically just go use and enjoy the boat "as is."

Pettit Paint offers a great step-by-step guide (pettitpaint.com) and offers products such as 7050 EZ-Fair Epoxy Fairing Compound (left) to help you complete to a satisfactory result.

Snapped!

[**Q**] Dear Boat Doc, there are a couple of cover snaps aboard my boat for which the screws that secure them have pulled out of the fiberglass. They are blind holes, so I cannot repair them by using a machine screw and a nut. Do you have a recommended epoxy that can fill these holes — one that is drillable and will withstand the rigors of snapping and unsnapping the cover? My other thought was a one-eighth-inch toggle bolt that I have found. Please advise.

KEITH STEVENS
Via email

[**A**] On the use of epoxy: It's great stuff, but not a miracle cure. For instance, in order to get sufficient surface area to undergo the stresses of a snap fastener, you would likely need to overdrill the current screw hole by, say, five diameters, tapering the edges of the new hole to a roughly 45-degree bevel. You'd need at least five-sixteenth-inch substrate thickness to do this properly. Then you'd fill the new larger hole with epoxy thickened with filler (I like colloidal silica), and then drill and tap for a machine screw of the right size after it's cured. We have created an *in situ* annulus, or ringlike part, such as this on many occasions. It's successful but may be more work than is necessary here.

Another way is to abandon the hole and add a snap to the canvas an inch or three away. You could "fill" the old hole

PHOTOS: (FROM TOP) COURTESY PETTIT PAINT; COURTESY STAR BRITE

[WE TEST STUFF]

Star brite Vinyl-Brite Vinyl Protector

As marine vinyl ages, mildew settles in and ultraviolet-resistant properties diminish along with the luster and resilience that make your boat's interior look inviting. I cleaned and dried my boat's vinyl, sprayed the interior with 4 ounces of Vinyl-Brite Protector, worked it in with bare hands and then left it to dry. I buffed it off with an old T-shirt and was rewarded with a nearly factory-new luster that persists in full sun two weeks later, shedding dirt and fish blood. $20 for 16 ounces; amazon.com — *Randy Vance*

Everglades®

by Dougherty

350LX

POWERED BY YAMAHA

Drop a line, and wine and dine.

everglades boats.com

EDGEWATER, FL | 1-877-90-BOATS

with a snap that would never be used — nobody would probably ever notice but you.

If you've found a toggle that is sized for a snap fastener (what, like a number 8 or 10 screw?), then that is what we would use. Fix it and go boating.

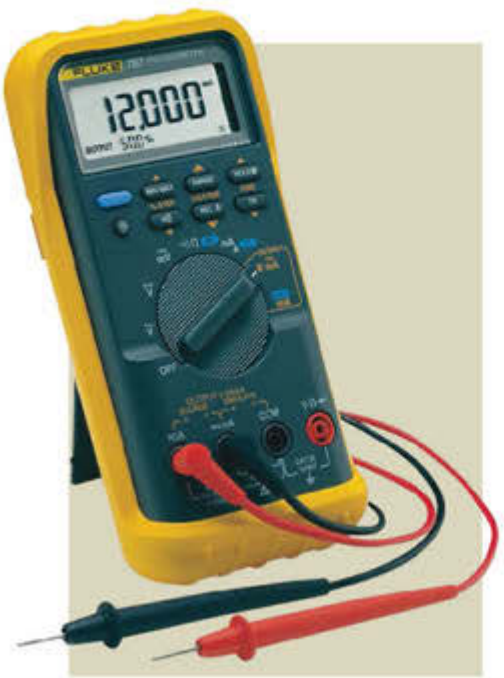
Shocked

[**Q**] I own a 1999 16-foot Sea Hunt center-console with a 60 hp Mercury outboard. When the deck gets wet, I get minor electrical shocks through the stainless steering wheel. I've read to look for exposed wires or connections, but, unfortunately, I cannot see any of these. Do you know what could cause this, and is there an easy solution?

Note: A junction terminal (bus bar) is mounted to the deck under the center-console, raised only about an inch. If this is the cause, can it be protected? Please help. I love this little boat.

MIKE GALFANO
North Bellmore, New York

[**A**] Hey, Mike. Does this happen regardless of footwear? Apparently, when the deck is wet, the path through that moisture and you back through the wheel is the least resistive path to ground. So, yeah, I'd be looking at that bus bar. Here are some troubleshooting steps.



1. Get a digital multimeter (below, left). Borrow or buy one. It is your best friend in this circumstance.
2. Set the meter to the lowest DC setting. Wet the deck with a hose. Touch one wire from the meter to the deck; touch the other to the wheel. Do this with everything electric, including with the ignition off. See if you get a reading in volts, since that is the scenario that gives you a shock.
3. If you get a reading, the current leak is coming from the bus bar or even back at the battery or batteries.
4. Touch the meter probe to the deck, and each terminal on the bus bar in turn, and look for a reading. Move to the battery switch and the battery/batteries themselves until you isolate the circuit.
5. If you get no reading at Step 2, start turning on switches one by one. When the meter lights up, you have found the faulty circuit. Check that circuit's entire run looking for frayed insulation, shorting to the steering cable, etc.

Finally, if you can relocate that bus bar, move it up higher.

Muffed It

[**Q**] Boat Doctor, in the June issue you answered a question ("Fuelish") from Thomas Witek regarding his fuel gauge not working. You stated in the last sentence to replace the sending unit where I think you meant to say "replace the gauge" (providing that there is power to the gauge during "key-up").

I find your articles to be quite informing. Keep up the great work.

JOHN HAGER
Southworth Marine Service

[**A**] John, you are correct. I don't know how that got past me, but I apologize. Thanks for setting the record straight.

Old-Boat Windshield

[**Q**] I have a 1973 24-foot Winner. The windshield frame got bent and the glass cracked. Where can I find a replacement?

JIM MCGRATH
Old Saybrook, Connecticut

[**A**] A glass shop can straighten or rebuild your frame and replace the glass in your windshield. Alternatively, contact Taylor Made Products (taylormadeproducts.com) for aftermarket choices that might fit.

Chalk It Up

[**Q**] My yellow-hull boat is only five years old. When I removed the cover this spring, there were areas that looked as though the yellow had been shot through with white. What could this be, and how can I get rid of it?

ALPHONSO VAVRA
Providence, Rhode Island

[WE TEST STUFF]

Star brite Boat Guard Speed Detailer

It's not a replacement for wax but a bridge and, I'd say, an extender between jobs. I particularly like using it around the fiberglass helm station, where a clean shine is important but soap isn't really welcome. I sprayed it on instruments and switch panels, then, with a microfiber towel, I rubbed it in and buffed it off. It smells like berries, not petroleum, and leaves a dry gloss instead of a soapy or oily finish. It stays on board my boat at all times. $10 for 22 ounces; westmarine.com — *R.V.*

PHOTOS: (FROM LEFT) COURTESY FLUKE, COURTESY STAR BRITE


Preferred by dogs
WHO PREFER
THE OUTDOORS.
THEY LOVE THE WILD
AS MUCH AS YOU.™
GRAIN-FREE
KIBBLE
+
FREEZE-DRIED
RAW
THE BEST DOG EVER Deserves MERRICK.
VISIT US AT WWW.MERRICKPETCARE.COM/BACKCOUNTRY.
Merrick
BACKCOUNTRY
RAW INFUSED
GREAT PLAINS RED RECIPE
GAME BIRD RECIPE
PACIFIC CATCH RECIPE
© 2015 Merrick Pet Care, Inc.

[**A**] Without seeing it, it's hard to say. But try this: Use some rubbing compound in a small area and see if you can buff off the white stuff. If you can, it's the hull's gelcoat color chalking — showing signs of age. Then buff off the rest, followed with a polish, and finish with a wax containing ultraviolet inhibitors.

Tow Rope Rules?

[**Q**] My neighbor says I am nuts for towing my kids on their tube from my wakeboard tower. I say the tower is rugged and installed with nuts and bolts and that he doesn't know what he is talking about. Who is right? We have a wager on this. (The loser has to cut the winner's lawn for a month.)

JIM SWENSON
Minneapolis, Minnesota

[**A**] When a wakeboarder falls, she lets go of the rope and there is no strain on the tower. But if a tube, or other tow toy, should dive under the water — as they sometimes do — there would be an immediate and catastrophic amount of strain on the tower's mounting hardware. This is exacerbated by the height of the tower, which lengthens the lever arm compared to the distance when tying off to transom rings or a ski tow on the transom. Never use a tower or a pylon to tow a tube.

Happy mowing!

What's the Diff?

[**Q**] What's the difference between a polish and a compound? I need to refinish my boat, but I am confused.

MIKE MONETTO
Casper, Wyoming

[**A**] In theory, a compound is a coarser grit formulation than a polish. In practice, the difference may be nil because marketing (regrettably) trumps proper labeling when a company wants its product to fit in a particular niche. My advice is to read the directions: Most will list the grit of sandpaper scratches they will remove. Use that to judge the aggressiveness of the polish or compound.

Oils Well

[**Q**] Can I use automotive oil in my boat's engine?

JAMES SANTANGELO
Providence, Rhode Island

[**A**] You can, but you may not want to. Please read "Marine Vs. Auto Oil" in the article by Charles Plueddeman that starts on page 70 of this very issue. It details the differences between marine oil and lubricants intended for other applications.

What Station?

[**Q**] I have a Grady-White powered by a Johnson outboard motor. Sometimes, my VHF marine radio will pick up engine noise. If I change channels, there is no engine interference. What's going on here?

ROBERT PATRICK
Reading, Pennsylvania

[**A**] Robert, a VHF radio can pick up radio frequency interference (RFI) from an engine. There are several remedies for this.

1. Make sure you are not powering the VHF off the ignition circuit.
2. If available, install "resistor" spark plugs for the engine. Resistors cancel the noise. You don't say how old your engine is, but newer models don't need resistor plugs.
3. There are noise-suppression filters built into some VHF antennas, like Shakespeare's Galaxy, which help squelch RFI.

The next time you hear interference, disconnect the antenna. If the noise continues, you know it's coming through the electrical circuits, not through the antenna. If that doesn't work, and you can't get resistor plugs, seek out an NMEA certified marine electronics technician to troubleshoot for you.

ASK THE DOCTOR

Send questions with your name and address to: boatdr@boatingmag.com or The Boat Doctor, *Boating*, 460 N. Orlando Ave., Suite 200, Winter Park, FL 32789.

NAUTICAL NO-NO

A Shallow Bilge

PHOTO: ED SHERMAN

The two flat-looking red handles in the lower right center of the photo are the primary battery switches for a compromised boat. The glossy-white fiberglass you can clearly see below those switch handles gives you a very clear look at the bottom of the sump, or bilge, aboard the boat in question.

Notice all the exposed battery-cable terminals on the backside of the switches, all at approximately the same height as those switch handles.

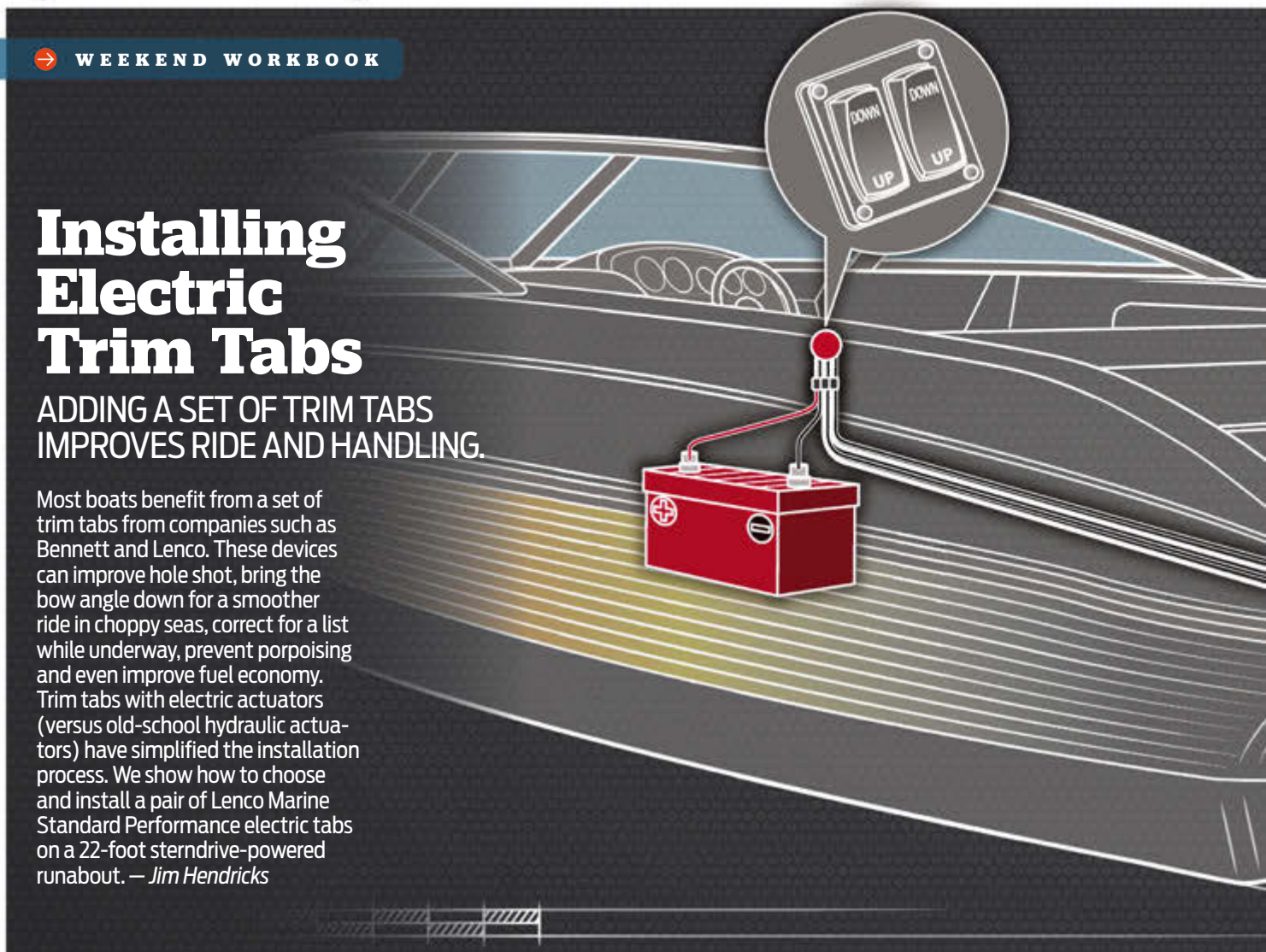
The bottom line here is that it won't take much bilge water to totally flood this compartment and cause major damage to the boat's electrical system. The American Boat and Yacht Council (ABYC) is pretty clear in its standards that say cables and gear, such as seen here, at the very least must be located "above the bilge high water mark." – *Ed Sherman*

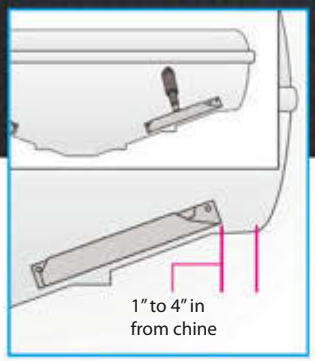
WEEKEND WORKBOOK

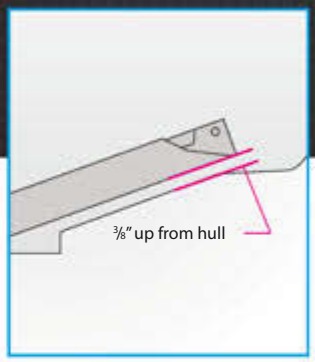
Installing Electric Trim Tabs

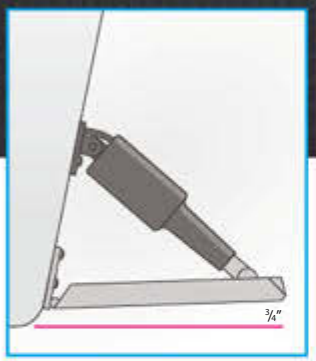
ADDING A SET OF TRIM TABS IMPROVES RIDE AND HANDLING.

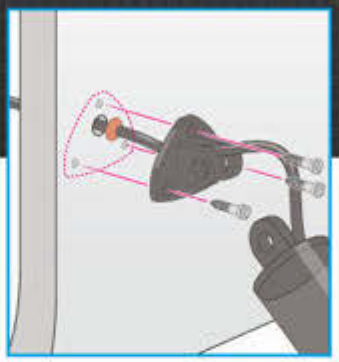
Most boats benefit from a set of trim tabs from companies such as Bennett and Lenco. These devices can improve hole shot, bring the bow angle down for a smoother ride in choppy seas, correct for a list while underway, prevent porpoising and even improve fuel economy. Trim tabs with electric actuators (versus old-school hydraulic actuators) have simplified the installation process. We show how to choose and install a pair of Lenco Marine Standard Performance electric tabs on a 22-foot sterndrive-powered runabout. — *Jim Hendricks*











1 POSITION THE TABS Locate the tabs as far to the outside of the transom as possible, with the inner edge of the tab no closer than 2 inches from a strake edge and the outer edge 1 to 4 inches from the chine. You need at least 11 inches of transom height for the Lenco 12-by-12-inch Standard Performance tabs used in this installation. Make sure the tabs are symmetrical — mirror images on each side.

2 MOUNT THE TAB Position the bottom of the leading edge of each tab ⅜ inch above the bottom of the transom, making sure this dimension is consistent from one edge of the tab to the other. Mark the mounting holes and drill a 3/16-inch hole 1¼ inches deep for the self-tapping No. 14 mounting screws. Thoroughly bed each area with an adhesive sealant such as Sikaflex 291, and then attach the trim tabs.

3 POSITION EACH ACTUATOR Secure a straightedge against the bottom of the hull so that it extends under the tab. Bolt the bottom of the actuator to the tab, nuts on top. With the actuator fully retracted, place the mounting pad flat against the transom, sliding it up or down until the trailing edge of the tab is ¾ inch above the straightedge. Mark the holes for the upper mount of the actuator. Ensure both tabs are mounted the same way.

4 INSTALL ACTUATORS Remove the upper mounting bracket, align the marks from step 3, and mark the cable hole location. Check for interference behind the transom, and then drill the 3/16-inch mounting holes 1¼ inches deep. Drill a ⅜-inch hole for the cable. Feed the cable through the mounting pad, slide the gland seal over the cable, and feed the cable through the transom. Bed and install the bracket with the No. 14 screws. Attach the actuator to the upper bracket.

EXTENSION CABLES

With the tab cables measuring 6 feet in length, most boats require extension cables to reach the helm from the transom. These are available in lengths ranging from 7 to 45 feet and connect at both ends with waterproof Deutsch plugs.

MORE ONLINE!

A tab's size is guided by the length of the boat and the available transom space. For a sizing guide from Bennett Marine, visit boatmag.com/tab-sizing-guidelines.

GETTING STARTED

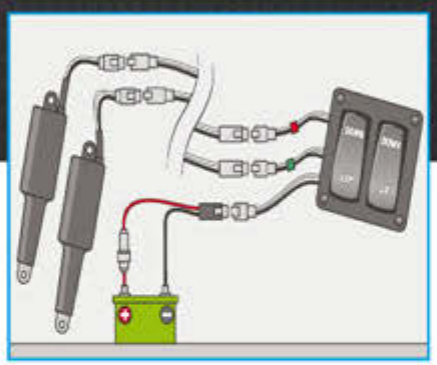
SKILL LEVEL

TIME TO COMPLETE

6½ HOURS

TOOLS AND SUPPLIES

- Lenco Marine 12-by-12-inch Standard Performance tabs ($599.99; overtons.com)
- Lenco double-rocker switch ($67; pbsboatstore.com)
- Pair of 26-foot extension cables ($142.50/pair; jamestowndistributors.com)
- Electric drill and drill bit set
- Box wrench set
- Socket wrench set
- Tape measure
- Straightedge
- 2-inch hole saw
- Phillips screwdriver set
- Sikaflex 291 or equivalent marine sealant
- Wire crimper/cutter
- Marking pencil
- Clean rags and rubber gloves (for cleaning up sealant)



5 INSTALL THE SWITCH PANEL After pulling the actuator cables snugly through the transom and attaching them to the cable extensions, snake the two cable extensions to an area behind the helm or console. Select a vertical or angled surface that's easy to reach from the helm to install the double-rocker switch panel (sold separately). Use the supplied template to mark the location. Check the area behind for interference; then use a 2-inch hole saw to cut the main hole. Drill the four ⅛-inch holes. Install the control pad with the supplied self-tapping screws.

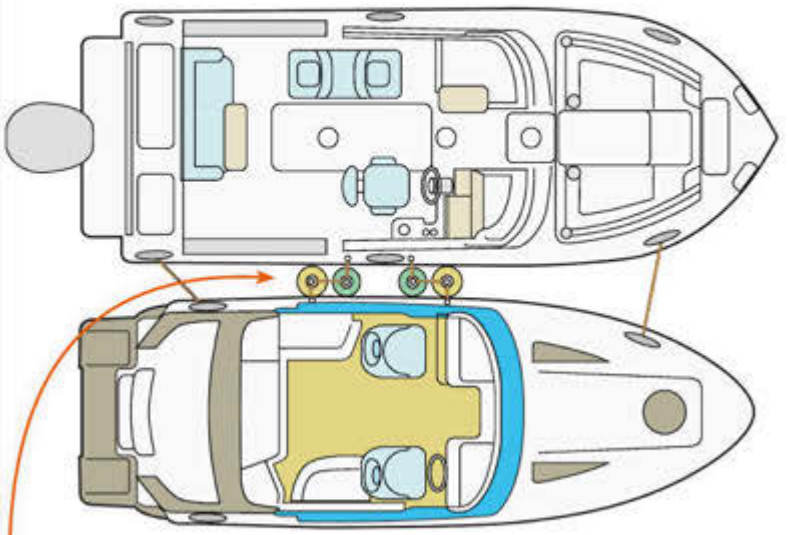
6 WIRE THE SWITCH PANEL Follow the supplied wiring diagram to connect the actuator cable extensions to the cable plugs on the back of the rocker switch panel, making sure starboard (with green tape) and port (red tape) cables are plugged into the correct connectors. Run the positive and negative power leads to the battery, with a 20-amp breaker or fuse for the positive wire. Test the tabs to make sure they are wired correctly. Be aware that the port rocker operates the starboard tab and vice versa. Thus, pushing "down" on the port rocker lowers the port bow and vice versa.

ILLUSTRATIONS: TIM BARKER; PHOTOS: COURTESY LENCO

TACTILE/ INDICATOR SWITCHES

Tactile and tactile/indicator switches (versus rocker switches) are also available for Lenco systems. If you chose a tactile switch, you'll also need to install a separate control box behind the helm within 2 feet of the switch. Both tab and switch cables connect at this junction box.

QUICK STUDY



How to Hang Your Fenders

Fender? Bumper? Who cares? A "fender" hangs off your boat temporarily to keep you away from a dock, another boat or an obstruction of some sort (fends you off). A "bumper" is attached to a car or truck. OK, so assuming you have fenders correctly sized to your boat, let's examine the techniques for maximum effectiveness and consider the best method of securing them to a cleat, stanchion or railing. ***– Joe Friedman***

Rafts

When rafting with other boats, use the largest-diameter fenders in your inventory since different boats tied together will rock differently and have varying freeboard and hull flare. Large-diameter ball fenders are a smart choice because they can hang from the rail or cleats over the topsides, yet are wide enough to keep rub rails from knocking together as well as areas with protruding decks, such as on boats with large bow flare.

Planks

When tied up to a smooth-surface pier, bulkhead or floating dock, vertical placement is the easiest, most practical and preferred method. Place the fender a few inches above the surface of the water to keep it from getting gunked up. A minimum of two fenders should be used, with one being placed at the widest point of the hull and one near the stern. However, the more, the merrier — and less chance of hull damage.

Tie-Offs

Cleats and deck-mounted specialty fittings are best for hanging fenders, since they have a low profile and cannot exert much leverage on the deck or the fasteners securing them. Rail stanchions are also OK to use. Due to the extra leverage created by extra height, hanging fenders to rails may subject the rail and deck to undue stress if a fender gets pinched during the rolling from a large wake. All tie-off points should be through-bolted.

Pilings

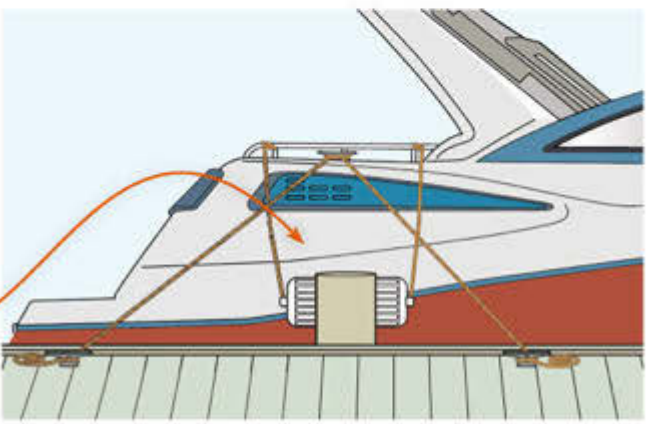
When tying up to a dock or pier with exposed pilings or a "navy style" bulkhead, horizontal placement is the way to go. Some fenders have molded eyes at either end; some let you pass a line through from top to bottom. In either event, center the fender on the piling and tie it horizontally. If the location is rough, or roiled by current, or you will be leaving the boat unattended for longer than lunch, consider using a fender board as an alternative. A pair of cylindrical fenders placed vertically behind a two-by-four is as basic as it gets. The fenders protect the hull and the two-by-four takes the beating from the pilings. Sweet.

LEARN MORE

To learn how to build a fender board, scan this tag or visit boatingmag.com/fender-board.

Knots

There are three basic knots that work equally well to secure a fender to a stanchion or rail: the clove hitch, the running hitch and the round turn/half hitch. A cleat hitch is used when securing to a deck-mounted cleat. It's not exactly a hitch, just a series of figure eights around the horn of a cleat, finished with a half hitch. Visit boatingmag.com/knots to learn how to tie them.



ILLUSTRATIONS: STEVE KARP


SAVE TODAY. SMOOTH WATER TOMORROW.
See how much you could save on boat insurance.
GEICO. for your boat
geico.com | 1-800-865-4846 | local office
Some discounts, coverages, payment plans and features are not available in all states or all GEICO companies. Boat and PWC coverages are written through Seaworthy Insurance Company, a Berkshire Hathaway affiliate, and through other non-affiliated insurance companies, and are secured through the GEICO Insurance Agency. GEICO is a registered service mark of Government Employees Insurance Company, Washington, D.C. 20076; a Berkshire Hathaway Inc. subsidiary. GEICO Gecko image © 1999-2015. © 2015 GEICO

WHAT TO LOOK FOR

Washdown Systems

Typically installed in order to hose down the self-bailing cockpit of a fishing boat, or as a means to clear stinky mud from anchor and chain before stowing them aboard, raw-water washdown systems add convenience for boaters. Here are some points to consider whether retrofitting your current boat or assessing the quality of the washdown system offered as an accessory aboard a boat you are buying. – *Kevin Falvey*

1 Through-Hull Fitting

This intake through which water from lake, bay or sea is fed to the pump is crucial. The best systems are fitted with a proper seacock, not just a valve. Unlike a valve, a seacock incorporates a mounting flange to be used with a backing plate plus a grease fitting, can be disassembled for service, and has a handle that indicates the open and closed positions at a glance. If metal, it will have a stud for attaching a bonding wire.

Shared Intakes

There are many successful washdown installations that share a raw-water intake with a livewell system. This is accomplished by installing a T-fitting or Y-valve on the intake hose. The advantage is the use of one through-hull fitting instead of two. A disadvantage is possible reduced pressure to either system when the other is operating.

2 Strainer

A strainer helps ensure reliability. So-called "scoop" strainers screw directly into the seacock and fasten to the bottom of the hull. There are also strainers, known as "basket strainers," that install in-line on the intake hose run. Using a scoop means fewer connections, and fewer opportunities for leaks; using a basket makes clearing an obstruction easier.

3 Intake Hose

This should be a nylon-reinforced, smoothbore hose rated to not collapse under the pressure of the pump. Many seasoned boaters prefer expensive "sanitation" hose for washdown use, though clear, reinforced hose allows one to see if any detritus has been sucked up. The hose should be double-clamped to both the seacock and the pump intake. Do not use rigid tubing for this hose run: It's not flexible enough.

4 Supply Hose

While the same hose used at the through-hull may be used for supply, rigid tubing is often used to carry water from the pump to the spigot. Tubing doesn't collapse and is of small diameter, making it easy to run and install. Tubing can become brittle due to ultraviolet light exposure, so be sure its run is concealed — or wrap exposed tubing in tape or run it inside looming — where it passes beneath or behind hawseholes or other places where sunlight can "sneak" in.

QUICK TIP

Always close all seacocks when leaving the boat unattended.

PHOTOS: (COUNTERCLOCKWISE FROM TOP) KEVIN FALVEY, COURTESY PERKO (3), COURTESY TRIDENT MARINE (2)

STINGRAY®

THE 192SC PUTS THE FUN IN FUNCTION!

Your adventure begins when you step aboard our new 192SC with best-in-class performance and fuel efficiency numbers. The 192 glides across the water, handling turns and chop with little effort. The layout is so superbly optimized for function that your passengers will notice only how much fun they are having. Contact your dealer for a test drive! Dealer and product information can be found at StingrayBoats.com/192SC

Dependability is our middle name.

YAMAHA

5 Spigot

A corrosion-resistant spigot, such as the chrome-plated brass fixture offered by Sea-Dog (shown), is a must if you boat in salt water. However, flush-mounted and quick-disconnect fixtures are also available. Make sure there is access to the intake hose connection on the back of the fixture via a hatch or deck plate, because it will need occasional service.

6 Pump

A washdown pump should be fitted with a pressure switch so you can leave the spigot on and have pressure available when you open the hose nozzle, but so the pump isn't running constantly, draining the batteries and overpressurizing the system. The pump should be self-priming and meet standards for ignition protection. As for size, we've never met a washdown hose with too much pressure.

7 Deck Hose

A cut-to-fit length of common garden hose is cheap, reliable and easy to repair or replace, though it suffers from the same coiling maladies you encounter at the dock or in your backyard. Pre-coiled "spring" hoses are popular, and many of these come with a dedicated shelf or rack that makes stowage neater than garden hose does, though coiled hoses can be subject to kinking and thus cutting off the water supply.

PHOTOS: (FROM TOP LEFT) COURTESY SEA-DOG LINE, COURTESY PENTAIR/SHURFLO, COURTESY OCEAN EQUIPMENT, COURTESY POCKET HOSE TOP BRASS

Pocket Hose Top Brass

Boating editors Pete McDonald and Randy Vance have both been using the collapsible, expandable Pocket Hose Top Brass, and both report great satisfaction. They say it stows easily, doesn't collapse and comes with quality brass fittings. $19.99; trypockethosetopbrass.com

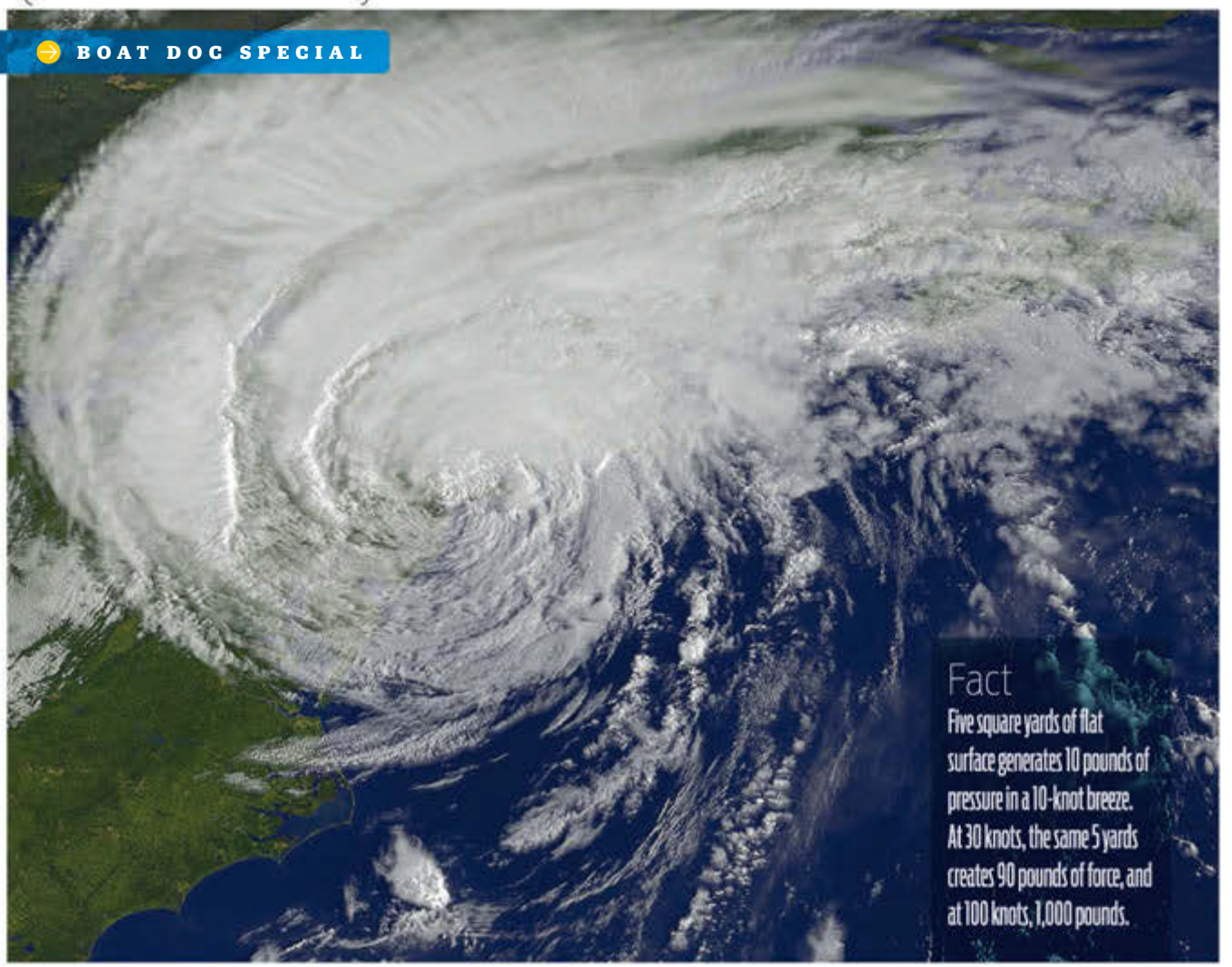
The combination of power, comfort, and Chris-Craft styling in the new Catalina 34 make this boat a one-of-a-kind on the water.

Capri | Carina | Bullet | Lancer | Corsair | Launch | Catalina
Visit www.chriscraft.com to build yours today

Chris-Craft

America's Boatbuilder Since 1874

BOAT DOC SPECIAL



Storm Warning

HOW TO SECURE YOUR BOAT FOR A HURRICANE

I'VE BEEN IN THE PATH OF MORE HURRICANES THAN I RECALL the names of. A few come to mind: Bob, Georges, Floyd, Isabella, Charley, Frances, Jeanne, Katrina, Wilma and Irene. These tips came from those experiences.

Stay Afloat

Not long ago, floating docks weren't safe to use in hurricanes. Now, storm-engineered floating dock systems survive Category 4 hurricanes, but that doesn't necessarily make them safe. "Protected" waters just a quarter-mile wide by a half-mile long have churned into 8-foot seas in 100-knot winds. Also, in waterways fed by inland storm runoff, a "mild" tropical storm might drop a yard of rain that turns tranquil canals into rivers.

Hurricane Storage

Hurricane-rated dry storage facilities and many boat yards offer annual contracts to store boats during every named storm that threatens, often garnering insurance breaks for the boat owner.

In a Slip

Anticipate that at least one cleat, piling or line will fail, so give each line a mate running in the same direction but attached at different places on both the boat and dock. To

PHOTOS: (FROM TOP LEFT) COURTESY NASA/NOAA GOES PROJECT, CAPT. VINCENT DANIELLO (6)

counter rising (or falling) storm tide, bypass the closest cleat or piling in favor of one farther away. Set an anchor across the marina, and once all boats are through moving, pull the rode tight with the windlass. Hang every fender you own.

On a Trailer

Capt. Will Beck, owner of Sea Tow Palm Beach, says, "I can readily find an empty warehouse big enough for my eight trailerable boats." Paying around $800 rent for three days, he says, "with what I save just in damage from blowing debris, it's money well spent."

Surplus fire hose — real stuff that firemen use — makes great chafing gear. Cut it with a serrated knife and use KY Jelly and a brush handle to get dock lines through the inner rubber jacket. (Honestly, it works.)

Capt. Chris Shaffner, who owns TowBoatU.S. Palm Beach, keeps his trailered boats outside. "Get the boat as close as you can to a strong building — anything to break the wind," he says. Avoid trees, power poles and also construction sites that create flying debris. Place blocks beneath the trailer frame on either side of the wheels, and then deflate the tires completely. Shaffner twists auger-type tie-down anchors into the ground using a broom handle. "Tie the boat to the trailer, and then tie the boat to those anchors," he says.

On a Lift

Lower a fixed lift 2 feet, tie the boat as if it were in a slip, and then raise the lift to put tension on those lines. Secure the boat to the lift.

Avoid Open Anchorages

"Hurricane holes" that we used to snug boats into now have waterfront homes with boats, and anchoring in open water doesn't work. "No matter how good your ground tackle is, someone else's will fail," Beck says. "That boat takes out another, and they drift into a third. After a storm, we see hundreds of boats in clusters on the shore."

Run

"For the time you spend blocking a trailer, tying it down, removing the canvas and then putting everything back later, just get in the truck and move the boat away from the forecast track cone," Shaffner says. (Head south of the forecast track; few hurricanes turn south.) Be sure the trailer is working at the start of the hurricane season.

— Capt. Vincent Daniello

When Canvas Should Stay

Removing tops and enclosures decreases windage and preserves canvas. On the other hand, hours of rain driven by 30-knot winds risk ruining electronics even with no other damage aboard. Either way, secure original-equipment covers over electronics with shrink-wrap tape, and tape tight-fitting canvas covers over the helm. *— V.F.D.*

Boston Whaler
420 Outrage

THIS BOAT IS SO BIG THAT, HAD WE NOT known Whaler's Outrage lineup of center-consoles, we could have easily mistaken it for an express. As it stands, the new 420 Outrage is not only one of the largest center-consoles on the market, but also the largest Boston Whaler ever built. With a 42-foot-6-inch length overall and a 13-foot beam, it is 5 feet longer and 1 foot 6 inches wider than the 370 Outrage, the previous flagship in the fleet. The 420's dry weight (without engines) is 7,500 pounds more too. That's close to four tons of extra displacement. That should give you an idea of just how large this new Outrage really is.

So the question to answer is "Can Whaler go big?" Of course it stands out at the dock for its stylish hardtop and raked windshield, sleek cabin windows and the four 300 hp Mercury Verados on the transom. But where it really shines is underway. Many of the new generation of 35-plus-foot center-consoles have issues with excessive bow rise climbing onto plane and higher-than-normal bow rise while running. They're big boats packed with a ton of amenities with heavy outboards in triple or quad installations adding weight and drag. While it's fitted out to the nines and hanging 2,600 pounds of outboard off the back, the 420 Outrage has one of the best attitudes of any large center-console we've tested. That means the captain's vision from the helm is never compromised. Underway, the trim tabs adjust automatically, ensuring a smooth ride no matter the conditions. (They can be manually overridden to suit the captain's preferences.) We came to appreciate this while running the boat amid traffic, because it was easy to account for all other boats in the vicinity.

NOTEWORTHY

The dedicated stainless-steel dive ladder stows on the transom, making this boat fit for dive duty.

With the optional joystick system, the 420 Outrage also helps you breathe easier around the docks. With the joystick engaged, the boat proved nimble in close quarters and came easily in and out of its slip. The joystick system allows the outboards to rotate independently of each other; combined with the bow thruster, the system moved the boat like a pod-drive setup. Traditional captains may cringe, but at this point I couldn't imagine buying a boat over 40 feet without a

With its luxurious bow, ergonomic helm and below-deck creature comforts, the 420 Outrage is adept at fishing, cruising and entertaining.

PHOTOS: (FROM TOP) BILL DOSTER, COURTESY BOSTON WHALER (3)

joystick system installed.

Boston Whaler already outfits its Outrages with a high degree of fit and finish and amenities, and going to 42 feet lets the company carry that even further. Start up in the bow section. Though the bow has the requisite rod holders built into the topsides and coaming bolsters around the gunwales, the layout allows for family use way beyond fishing, with a sun pad north of the console with forward-facing recliners and a flip-up section in the middle that creates a stadium-seating effect. The tag ends of the wraparound bow lounge also flip up to create recliners. The aft cockpit features flip-down seating on the transom and a flip-up leaning post that doubles as a bait prep center, with the option to make it a summer kitchen for entertaining. A portside dive door also aids in side-to boarding at the marina.

While builders like Hydra-Sports, with its 5300 Sueños, have taken the shock value out of a 40-foot center-console, there are others building models comparable to the 420 Outrage. The Everglades 435 CC ($681,538 with four Yamaha F350s) is the most obvious comparison, since both have unsinkable construction and reputations for being well built. Being among the select few to sea-trial both boats within days of each other, we got a good feel for their similarities and differences. The Everglades is the faster boat, with a lighter (16,600-pound) dry weight and the extra 200 hp pushing it along. The Everglades we tested felt more attuned to the hard-core, blue-water angling crowd, while the Whaler had more family-oriented creature comforts, but we're splitting hairs a bit here because the 420 Outrage is certainly well equipped to fish.

Start with the 55 square feet of open cockpit space behind the double rows of seating and stand-alone galley. There's a 24-gallon transom livewell, recessed toe rails, insulated fish boxes fore and aft, and 23 rod holders around the boat. An inboard-swinging dive door in the cockpit to port will aid the wire man in handling large pelagics. The deluxe leaning post features an additional 40-gallon livewell and a bait prep station. Game on.

Want to run to the Bahamas (or to any outpost within range)? The 420 has 6 feet 4 inches of headroom belowdecks, with the overhead skylight and lengthy built-in portals providing a wealth of natural light. The brightly appointed interior features a convertible double berth, a galley with a faux-granite countertop, and a private head and shower. (It should be noted that the shower sump is easily accessible in the head for maintenance.) Want to get out of the elements? A wood table pops up from the berth to form a dinette for some casual dining belowdecks. A standard 16,000 Btu air-conditioning system keeps it chilled. Catch the latest show on the 28-inch flat screen or crank up the tunes on the standard Fusion stereo system. This interior, combined with the open layout the 420 Outrage affords abovedecks, means no matter where you're going, there's ample room to roam.

So can Whaler go big? The answer is absolutely.

— *Pete McDonald*

SCAN ME! To see a photo gallery of the Boston Whaler 420 Outrage, visit boatingmag.com/2898 or scan this tag!

AVAILABLE POWER: OUTBOARD

High Points

- A dedicated 12,000 Btu air conditioner cools the helm and leaning post.
- The hardtop features a sturdy powder-coated aluminum frame and an electrically deployed sunshade that serves the entire cockpit.
- Raked windshield sports a standard, electrically actuated center vent and a wiper with a stainless-steel arm.

Low Points

- Outboard setup makes it harder to swing fish around the transom than aboard comparably sized inboard fishing rigs.
- We'd sure like to see even a subtle fiddle rail on the galley counter-top belowdecks.

LOA: 42'6" **Beam:** 13'0" **Draft:** 2'7" **Displacement:** 22,000 lb. **Transom Deadrise:** 22 degrees **Bridge Clearance:** 18'6" **Max Headroom:** 6'4" **Fuel Capacity:** 600 **Water Capacity:** 60 gal. **Max Horsepower:** 1,675 **Available Power:** Mercury Outboards

Price: $744,561 (base boat with standard power)

BOATING Certified Test Results

SPEED			EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
1000	6.13	7.05	4.10	1.49	1.72	807	929	2	66
1500	7.34	8.45	6.70	1.10	1.26	592	681	2	67
2000	8.91	10.25	12.10	0.74	0.85	398	457	3	70
2500	9.91	11.40	21.40	0.46	0.53	250	288	5	73
3000	11.90	13.70	31.20	0.38	0.44	206	237	4	76
3500	17.25	19.85	41.70	0.41	0.48	223	257	4	80
4000	23.55	27.10	51.70	0.46	0.52	246	283	3	82
4500	29.37	33.80	58.90	0.50	0.57	269	310	2	84
5000	36.67	42.20	70.70	0.52	0.60	280	322	2	87
5500	39.97	46.00	92.20	0.43	0.50	234	269	2	90
6200	42.58	49.00	119.00	0.36	0.41	193	222	2	93

MOST ECONOMICAL CRUISING SPEED

HOW WE TESTED

ENGINES: Four 300 hp Mercury Verado outboards **DRIVE/PROP:** Revolution 14¾" x 19" 4-blade stainless steel **GEAR RATIO:** 1.85:1 **FUEL LOAD:** 500 gal. **CREW WEIGHT:** 500 lb.

Boston Whaler Edgewater, Florida; 877-294-5645; bostonwhaler.com

PHOTO: BILL DOSTER

MORE THAN INNOVATIVE, THIS SUZUKI REDEFINES PERFORMANCE

300 HORSEPOWER
THE ULTIMATE OUTBOARD FROM SUZUKI. PERFECT FOR SINGLE, TWIN, TRIPLE OR QUAD INSTALLATIONS, A GREAT CHOICE WHEN IT'S TIME FOR REPOWER

IMPRESSIVE ECONOMY
LEAN BURN CONTROL TECHNOLOGY FOR OPTIMAL FUEL ECONOMY, ESPECIALY WHEN CRUISING LONGER DISTANCES

SUZUKI SELECTIVE ROTATION
THIS IS THE FIRST OUTBOARD TO FEATURE A HIGH PERFORMANCE GEARCASE CAPABLE OF EITHER STANDARD OR COUNTER ROTATION WITH THE FLIP OF A SWITCH

SUZUKI PRECISION CONTROL
ELECTRONIC THROTTLE AND SHIFT FOR SMOOTH, CONFIDENT CONTROL. COMPATIBLE WITH SUZUKI PRECISION MANEUVERING JOYSTICK CONTROL

BUILT FOR POWER
V-SIX 24-VALVE DOHC POWERHEAD WITH 4.0 LITER DISPLACEMENT AND MULTI-POINT SEQUENTIAL ELECTRONIC FUEL INJECTION

PERFORMANCE MATTERS
VARIABLE VALVE TIMING AND DIRECT AIR INTAKE FOR CRISP THROTTLE RESPONSE AND ACCELERATION

TRANSOM-FRIENDLY
LIKE ALL SUZUKI OUTBOARDS, THE DF300AP USES STANDARD BOLT PATTERN AND FITS 26-INCH ON CENTER

AWARD WINNING INNOVATION
THE SUZUKI DF300 HAS TWICE RECEIVED THE COVETED NMMA INNOVATION AWARD FOR ADVANCED TECHNOLOGY

The Suzuki V-Six DF300AP Puts You On The Leading Edge Of Technology, Performance And Reliability

It was the first V6 4-stroke outboard to hit 300 HP, and we've stayed on target ever since. Suzuki's DF300 was the also first to feature integrated electronic throttle and shift controls and the first to take powerboating to a whole new level of performance and reliability.

Suzuki broke the innovation barrier again with the introduction of Suzuki Selective Rotation, allowing the DF300AP to go from standard to counter rotation with the flip of a switch.

Whether your considering power options for a new boat, or ready to repower, you owe it to yourself to take a close look at the outboard that changed everything. For more details, see your Suzuki Marine dealer or visit www.suzukimarine.com.

GIMMESIX! 3+3 SIX YEAR PROTECTION

SUZUKI MARINE

THE ULTIMATE™ 4-STROKE OUTBOARD

$800 SUMMERTIME CASH

Gimme Six Extended Protection promo is applicable to new Suzuki outboard motors from 25 to 300 HP in inventory which are sold and delivered to buyer between 07/01/15 and 09/30/15 in accordance with the promotion by a Participating Authorized Suzuki Marine dealer in the continental US and Alaska to a purchasing customer who resides in the continental US or Alaska. Customer should expect to receive an acknowledgement letter and full copy of contract including terms, conditions and wallet card from Suzuki Extended Protection within 90 days of purchase. If an acknowledgement letter is not received in time period stated, contact Suzuki Motor of America, Inc. – Marine Marketing via email: marinepromo@suz.com. "Summertime Cash" rebates apply to qualifying purchases of select Suzuki outboards made between 07/01/15 and 09/30/15. For list of designated models, see participating Dealer or visit www.suzukimarine.com. Customer and participating Dealer must fill out the rebate form at time of sale. Customer will have the choice to either apply the cash rebate against the original dealer invoice (Suzuki will credit Dealer parts account) or have a check sent directly to the customer. The Gimme Six Promotion is available for pleasure use only, and is not redeemable for cash. There are no model substitutions, benefit substitutions, rain checks, or extensions. Suzuki reserves the right to change or cancel these promotions at any time without notice or obligation. "Gimme Six", the Suzuki "S" and model names are Suzuki trademarks or ®. Don't drink and drive. Always wear a USCG-approved life jacket and read your owner's manual.

Outerlimits
SL 41

WHILE EXAMINING THE TRANSOM OF THE Outerlimits SL 41 before our sea trial, we noticed that the Mercury Racing 380S K-Plane trim tabs were installed horizontally rather than parallel with the V-shape of the boat's bottom.

In the go-fast world, riggers and throttle men have long argued the merits of having the tabs in this position because it requires less tab adjustment to affect the boat's attitude. Lower a single tab a couple of degrees to counter a crosswind or quartering wind or similar seas. Drop them both to keep more of the boat in the water in rough, head-on seas. Typically, performance-boat manufacturers didn't install tabs this way because they didn't want less-experienced drivers to get in trouble by using too much tab, especially with today's stepped bottom designs.

However, Outerlimits owners are not rookies. They know that, when it comes to applying tabs on a stepped hull running faster than 100 mph, a little goes a long way. That's what we found when we ran the SL 41 powered by staggered Mercury Racing 700 SCi engines with NXT6 drives. Testing in strong crosswinds put the trim-tab theory to a good test. Lowering a tab to counter the crosswinds leveled the boat, and we ran 114 mph. A new element on the SL 41's five-step bottom is a small pad in the running surface at the stern. Outerlimits found that the pad generated so much lift that the boat ran better with a 1-inch spacer in the drives to put the props a little deeper in the water. Other bottom-design updates on the SL 41 came from what Outerlimits learned when it set the reigning V-bottom kilo speed record at 180.470 mph on the Pamlico River in North Carolina in April 2014. The large air intakes at the chines have been removed, and the angle of the steps from the chine to the keel isn't as pronounced. The overall design provides more even lift across the running surface to keep the boat riding level.

Our top speed is about 10 mph faster than you can expect

NOTEWORTHY

The SL 41's aft bench cushions are individually upholstered, and they latch in place so repairing one doesn't require removing the whole seat.

PHOTOS: MEDIA ONE 7

The Outerlimits SL 41 strikes a bold profile underway en route to open water. The engines, electronics and seating are all installed in fastidious fashion.

from Nor-Tech's 427 ($620,000 with the same power). Credit for some of that edge can go to the weight saved by Outerlimits' construction methods, which use epoxy resin, E-glass, and carbon and Kevlar reinforcement. Each piece of treated hull and deck reinforcing fabric and coring is laid in the mold and vacuum-bagged to eliminate air and excess resin, which could weaken the lightweight epoxy construction. Parts are then cured in an autoclave — a computer-controlled oven — for two days. The stringers and transom are cored with composite Penske boards. Other manufacturers use similar materials, but Outerlimits is the only one to cure the boat in an autoclave to get the optimum combination of strength and weight.

Another change came in the deck design of the SL 41. Outerlimits buyers haven't been asking for boats with substantial cabin headroom, so the SL 41 has a low, flat deck much like those of classic V-bottoms from the 1970s and 1980s. The deck slopes up at the helm to keep air off the passengers, and for a 5-foot-8-inch-tall guy like me, the view over the bow is excellent.

While the deck is old school, the helm screams modern high-tech. There are no individual instruments. Everything displays on the Mercury Racing VesselView 7 screen and twin Garmin 8212 multifunction displays (with GPS and chart plotting, of course). Keyless ignition powers up the engines, and the throttle levers have integrated trim buttons for the drives and tabs.

Even with the low-profile deck, the cockpit has 45 inches of depth. The driver and co-pilot travel in stand-up bolsters with fixed bottom cushions. Ahead are two footrests, so you can sit by using the higher one and lean with the lower one. Four individual buckets with hold-down straps comprise the bench seat. Battery switches are beneath the cockpit steps, and there's stowage in the gunwales and in a zippered compartment next to the co-pilot's bolster. Aft in the engine compartment, the two 700 SCis are in a staggered installation with the port motor forward. All the rigging is hidden beneath the one-piece compartment liner, and there are removable panels to access the batteries and engine-mount backing bolts.

A roll-up aluminum door protects the cabin entry. Aft, and to port, are a large locker with a zippered cover and a drop-in cooler with a hatch that opens on a gas strut. Across to starboard, where most people would expect to find the head, is another large locker that unzips to reveal the stereo amplifiers. The portable head is forward beneath the V-berth: Push a button and it slides out on stainless-steel tracks. There's good sitting headroom on the facing berths and space for two adults to relax on the V-berth. Lockers in the partial bulkheads between the berth and lounges have the opening on the forward side. If the hatch is on the aft side, when the boat is run in rough water those hatches won't stay closed and the locker contents will be on the cabin floor. By putting the hatches on the front side, they stay closed and the contents stay put. Like the trim-tab installation, this small detail shows that the team at Outerlimits knows what it's doing. — *Eric Colby*

SCAN ME! To see more photos of the Outerlimits SL 41, go to boatingmag.com/2899 or scan this tag!

AVAILABLE POWER: STERNDRIVES

High Points

- No comparably sized boat can best the SL 41's speed with the same power.
- Lower deck lines give drivers an excellent view over the bow.
- Engine compartment is the cleanest we've seen.

Low Points

- It will be tough to remove the port battery.
- The parallel switch for the batteries isn't labeled.

▶ **LOA:** 41'3" ▶ **Beam:** 9'0" ▶ **Draft:** 3'0" ▶ **Displacement (approx.):** 9,300 lb. ▶ **Transom Deadrise:** 24 degrees ▶ **Bridge Clearance:** 4'10" ▶ **Max Cabin Headroom:** 5'3" ▶ **Fuel Capacity:** 210 gal. ▶ **Max Horsepower:** 1,400 ▶ **Available Power:** Twin Mercury Racing sterndrives to 1,400 hp total

Price: $625,000 (with test power)

BOATING Certified Test Results

SPEED			EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
1000	8.30	9.55	8.40	0.99	1.14	183	216	2	98
1500	12.69	14.60	15.90	0.80	0.92	148	174	3	87
2000	22.16	25.50	19.20	1.15	1.33	214	252	2	90
2500	37.41	43.05	25.90	1.44	1.66	268	315	1	91
3000	46.97	54.05	32.30	1.45	1.67	270	318	1	93
3500	55.00	63.29	47.10	1.17	1.34	216	255	1	95
4000	66.09	76.05	56.30	1.17	1.35	217	256	1	97
4500	78.29	90.10	75.10	1.04	1.20	194	228	1	99
5000	89.59	103.10	90.20	0.99	1.14	184	217	1	100
5300	100.89	116.10	92.40	1.09	1.26	202	238	1	101

MOST ECONOMICAL CRUISING SPEED

HOW WE TESTED

ENGINES: Twin 700 hp Mercury Racing 700 SCi gasoline sterndrives **DRIVE/PROP:** NXT6/17¼" x 39" stainless steel **GEAR RATIO:** 1.5:1 **FUEL LOAD:** 50 gal. **CREW WEIGHT:** 550 lb.

Outerlimits Offshore Powerboats Bristol, Rhode Island; 401-253-7300; outerlimitspowerboats.com

PHOTO: MEDIA ONE 7

BECAUSE YOU KNOW IT'S NOT ONLY THE SUN THAT THREATENS YOUR BOAT.

303® products are scientifically formulated for superior protection. Like Aerospace Protectant, which not only provides the ultimate UV resistance against fading and cracking, it also prevents staining from dreaded sunscreen. Its no-residue finish repels dust, grime, salt and soiling to keep your boat looking newer, longer. Obsessively protective, just like you. **Available at West Marine,® Cabela's® and participating Marine dealers.**

TRY ALL OUR 5-STAR RATED MARINE PRODUCTS:

- MULTI-SURFACE CLEANER
- FABRIC GUARD
- **NEW!** CITRUS CLEANER & DEGREASER
- **NEW!** CLEAR VINYL PROTECTIVE CLEANER
- **NEW!** QUICK WAX

303products.com

WE'VE GOT YOUR NUMBER™

Nor-Tech
390 Sport Open

WITHOUT A DOUBT THE FOUR NEW Mercury Racing Verado 400R outboards installed on the transom of the 2015 Nor-Tech 390 Sport Open we tested grabbed our attention, especially at the top speed of 92.2 mph they helped deliver at 7,000 rpm. We were just as interested in the comfort-focused upgrades that Nor-Tech has made to this mega-console boat since we tested the 2014 version.

First, Nor-Tech redesigned the helm. The big, flat panel can now accommodate two 15-inch chart plotters and still have space for a 7-inch screen and a stereo head in between them. Our test boat had two huge Garmin GPSMAP chart plotters with Mercury's SmartCraft screen in the middle of a carbon fiber panel shaded by a 3- to 4-inch eyebrow. Visibility of this instrumentation proved excellent underway.

EXTRA POINT

About half of Nor-Tech owners are opting for the new Mercury engine colors in lieu of traditional black.

Additionally, the T-top frame sports a new sweptback design with fewer pipe obstructions in the helmsman's sight lines. Yet we did not notice undue wracking or shaking from this new top. In the bow, the chaise-lounge-style seat on top of the cabin has integrated cup holders, each lit by an LED light, and fold-down armrests. To make boarding easier, there are steps integrated into the amidships gunwales and the starboard swing-in dive door now comes standard. Finally, to better illuminate the cabin, Nor-Tech installed a skylight in the console. There is also a portlight with stainless-steel trim.

When you build a boat with a 10-foot beam, you can design a console that can protect three people in individual stand-up bolsters with drop-out seat bottoms. Clamped in place in the backside of the bolster bases aboard the 390 Sport Open is a portable cooler, and an aft bench seat has a bottom cushion that pulls out to access all the mechanical accessories. Nor-Tech finished the bilge in Awlgrip for a custom touch.

A hatch in the port side of the helm console accesses the cabin and head area. There's a berth that's just shy of 6 feet long with seated headroom at the aft end. The skylight opens up the area by letting in the sun's rays, while the head with holding tank is there to help answer nature's call.

Of course in a boat like the 390 Sport Open, the louder call will be to enjoy the great outdoors, and the seating options and cockpit depth make that easy to do. Of course, the acceleration of 1,600 horses on the transom doesn't hurt either. Cruising at 70 mph, we nailed the throttles and in seconds hit top speed. That's attention-getting. — *Eric Colby*

MORE ONLINE To see more photos of the Nor-Tech 390 Sport Open, visit boatingmag.com/2900.

AVAILABLE POWER: OUTBOARD

High Points

- Incredible acceleration was produced by Merc's 400 hp outboards.
- Side wings on the windscreen proved effective at keeping the wind off crew at the helm.
- Forward chaise-style lounge on the 390 Open is super-comfortable and secure.

Low Points

- We'd like to see a gate or hatch to close off the port passage to the stern.
- Our test boat didn't have the switches for the optional windlass labeled.
- It's strictly personal, but we can't get used to white Mercury outboards.

Toughest Competitor

- Midnight Express' 39S Cuddy is fully cored and resin-infused and weighs in at 8,000 pounds. With quadruple 400Rs, it will top 100 mph, according to its maker, and the retail price for the base boat is $399,000.

LOA: 39'0" **Beam:** 10'0" **Draft:** 2'4" **Displacement (with power):** 12,000 lb. **Transom Deadrise:** 23 degrees **Bridge Clearance:** 9'0" **Fuel Capacity:** 310 gal. **Max Horsepower:** 1,600 **Available Power:** Triple or quad Mercury outboards up to 1,600 hp total or triple Seven Marine outboards up to 1,881 hp total

Price: $585,785 (with test power)

BOATING Certified Test Results

SPEED			EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
1000	6.04	6.95	5.30	1.14	1.31	318	366	0	71
1500	8.95	10.30	10.10	0.89	1.02	247	285	2	73
2000	9.82	11.30	15.50	0.63	0.73	177	203	2	77
2500	13.34	15.35	18.50	0.72	0.83	201	231	2	80
3000	27.37	31.50	24.40	1.12	1.29	313	360	1	86
3500	36.24	41.70	27.10	1.34	1.54	373	429	1	93
4000	43.06	49.55	37.70	1.14	1.31	319	367	1	94
4500	48.32	55.60	51.50	0.94	1.08	262	301	1	92
5000	55.96	64.40	61.70	0.91	1.04	253	291	1	97
5500	62.61	72.05	77.10	0.81	0.93	227	261	1	100
6000	67.95	78.20	110.20	0.62	0.71	172	198	1	110
6500	73.30	84.35	149.70	0.49	0.56	137	157	1	112
7000	80.90	93.10	154.80	0.52	0.60	146	168	0	113

MOST ECONOMICAL CRUISING SPEED

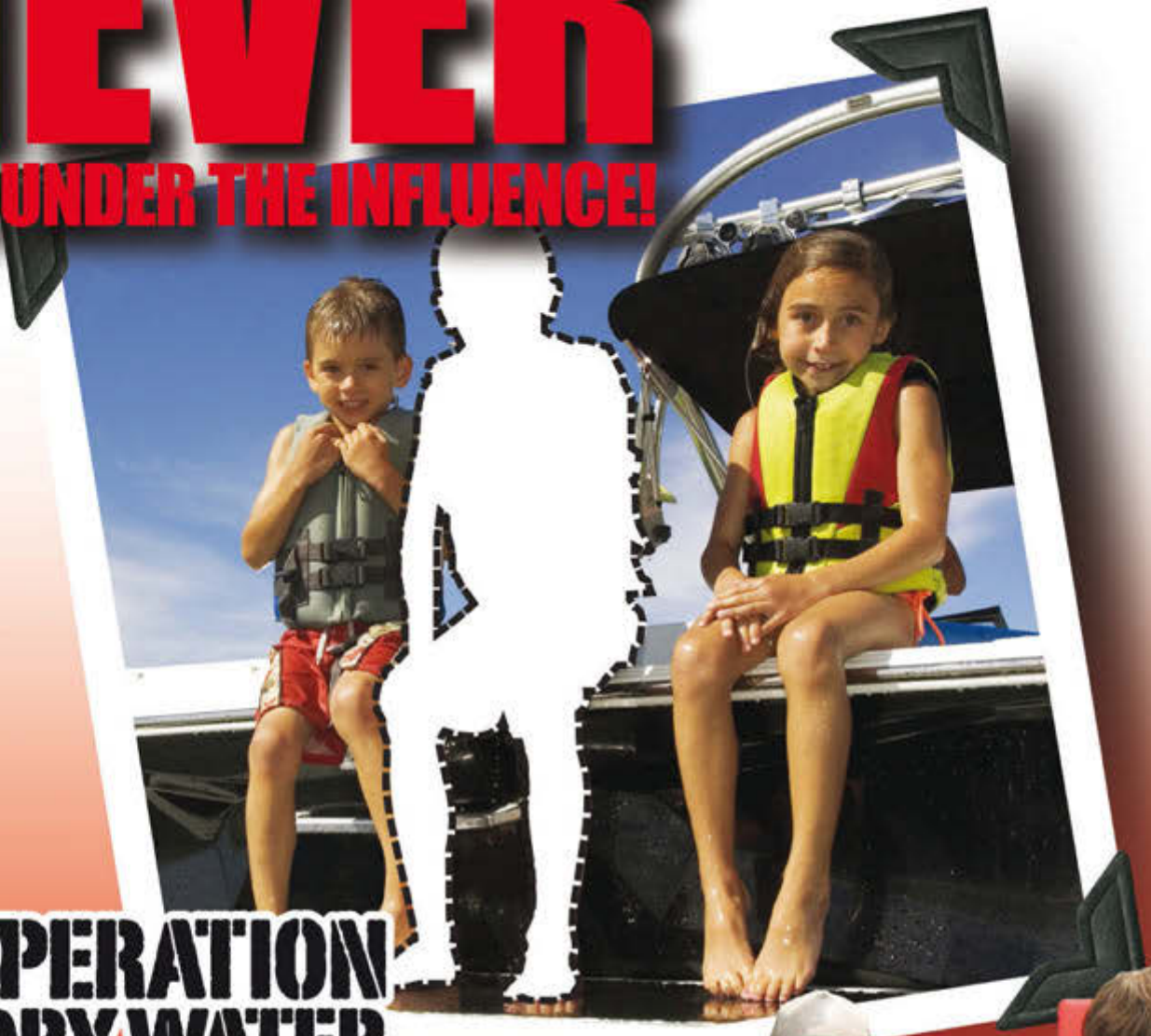
HOW WE TESTED

ENGINES: Four 400 hp Mercury Racing R400 outboards **PROPS:** 15¼" x 31" 3-blade stainless steel **GEAR RATIO:** 1.75:1 **FUEL LOAD:** 194 gal. **Crew Weight:** 700 lb.

Nor-Tech Hi-Performance Boats Fort Myers, Florida; 239-567-5030; nor-techboats.com

PHOTO: JAY NICHOLS/NAPLES IMAGE

NEVER
BOAT UNDER THE INFLUENCE!



OPERATION DRY WATER

operationdrywater.com

INCREASED BUI ENFORCEMENT JUNE 26-28, 2015

Boating Under the Influence is not only illegal, it's dangerous.

Alcohol use is the leading contributing factor in recreational boater fatalities and officers are working to keep waterways safe by enforcing the law.

If you boat under the influence of drugs or alcohol, you will be caught.

Don't risk it. Never boat under the influence!

YOUR BOATING DOLLARS AT WORK

NASBLA

Produced under a grant from the Sport Fish Restoration and Boating Trust Fund, administered by the U.S. Coast Guard.

Bayliner Element XL

WHEN THE ORIGINAL BAYLINER Element made its debut a few years back, we found a lot of things to like about it, most notably how its production signified Bayliner's commitment to keeping boating easy and affordable. One thing we didn't love about it was its size; with its 16 feet and 60 hp outboard we could see boaters easily outgrowing it. While that original Element is still a great-selling boat with a fantastic price, we're bigger fans of the Element XL simply because it's bigger.

EXTRA POINT

The optional fishing package adds a trolling motor, fish finder, livewell and casting seats to turn the XL into a solid bay boat.

The XL version has an overall length of 18 feet 2 inches and a 90 hp Mercury as its base power. That doesn't seem like much, but on the water you definitely feel the difference. The boat feels roomier, more capable in a chop and, especially with our optional 115 hp test power, faster. Everyone in the family's getting up on skis behind this boat, and with the optional fuel system that holds six extra gallons, they're staying out a lot longer too.

The XL is still based on the M-hull, a hull design that functions like a trimaran, with the V running down the centerline and two V-shaped sponsons outboard with hard chines. This surface, which extends out to the full beam, creates an extremely stable and predictable hull. Unlike a traditional V-hull, the boat doesn't dramatically tip from side to side with the shifting weight of a moving crew. During testing, the boat climbed onto plane in 3.7 seconds with minimal bow rise and hit 30 mph in 7.7 seconds. Also, whereas we could barely break 30 mph in the smaller Element, we were able to push this boat to 43 mph when we dropped the Bimini top. The M-hull doesn't exhibit the same bite in turns as a traditional V-hull, though, which we noticed executing hard-over turns at 30 mph. Even so, the signature trait of this hull, other than the stability, is predictability. First-time boaters, and veteran boaters for that matter, will find no unpleasant handling surprises.

The layout is minimalist, with fixed seating at the helm and the side console, but spacious. The extended swim steps provide water access. The bow cockpit is a true social gathering point, especially compared with a similarly sized bowrider where two adults in the bow would likely knock knees. Plus, this boat is so easy to maintain and so spacious (it can easily hold its nine-person max capacity) that we'd call it not just a first boat, but a keeper. — *Pete McDonald*

MORE ONLINE To see more photos of the Bayliner Element XL, visit boatingmag.com/2901.

AVAILABLE POWER: OUTBOARD

High Points

- Swim ladder angles away from the outboard on the spacious, extended swim step.
- There's great seating in the cockpit, which has rear-facing lounges and stowage underneath.
- Design calls for minimal maintenance, so the boat can be ridden hard and put away wet.

Low Points

- We still wish Bayliner would add a tachometer.
- You'll find minimal wind protection at the helm.

Toughest Competitor

- There's not much like the Element, but check out the bigger, beamier Stingray 192SC, a deck boat that sells for $34,366 with a Yamaha F115.

LOA: 18'2" **Beam:** 7'5" **Draft (max):** 3'0" **Displacement (approx.):** 2,000 lb. **Transom Deadrise:** N/A **Bridge Clearance:** 5'0" **Fuel Capacity:** 18 gal. **Max Horsepower:** 125 **Available Power:** Mercury gasoline outboards

Price: $20,260 (with test power)

BOATING Certified Test Results

SPEED			EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
1000	3.82	4.40	0.51	7.50	8.63	121	140	1	57
1500	5.39	6.20	1.00	5.39	6.20	87	100	2	60
2000	6.43	7.40	1.60	4.02	4.63	65	75	4	65
2500	8.60	9.90	2.30	3.74	4.30	61	70	5	68
3000	16.68	19.20	2.50	6.67	7.68	108	124	3	76
3500	21.46	24.70	3.50	6.13	7.06	99	114	2	77
4000	25.11	28.90	4.40	5.71	6.57	92	106	2	76
4500	27.89	32.10	6.00	4.65	5.35	75	87	2	76
5000	30.33	34.90	7.70	3.94	4.53	64	73	2	82
5500	33.89	39.00	9.90	3.42	3.94	55	64	1	81
6000	37.37	43.00	11.00	3.40	3.91	55	63	1	83

MOST ECONOMICAL CRUISING SPEED

HOW WE TESTED

ENGINE: Single 115 hp Mercury FourStroke outboard **PROP:** 13¼" x 17" 3-blade aluminum **GEAR RATIO:** 2.07:1 **FUEL LOAD:** 15 gal. **CREW WEIGHT:** 380 lb.

Bayliner Boats Knoxville, Tennessee; bayliner.com

PHOTO: COURTESY BAYLINER BOATS

RATCHET UP YOUR PROTECTION

Outer Armor has the most advanced and durable ratchet pockets on the market. Our molded rubber pockets protect the ratchet mechanisms as well as the finish of your boat. The ratchets are easy to use, and will help hold the cover to ensure your boat cover is on tight for the long haul. **Make sure you ask your local Yamaha® Dealer about an Outer Armor - Built by Commercial Sewing boat cover. Because quite honestly your boat will thank you.**

WRAP IT UP!

YAMAHA

OUTER ARMOR
BUILT BY COMMERCIAL SEWING®

VACUHOLD · SURLAST · Apex Canvas Company

COMMERCIALSEWING.COM

LIGHTWEIGHT | STRAPLESS | TRAILERABLE | CUSTOM FIT | HIGH-STRENGTH | FADE RESISTANT

Nova
39 Sport

WE SAY Nova Boats' 39 Sport capably handled 4- to 5-foot seas and, powered by twin 370 hp Volvo Penta diesel sterndrives, topped out at 49.7 mph.

A unique element of the 39 Sport's patent-pending bottom is a keel pad at the transom to provide lift. Also, the inner strakes curve downward at the bow, assisting in creating a soft re-entry. Those strakes extend to amidships, while the outer set runs full length. The 5-inch-wide chines are turned down 8 degrees. Handling is confident and predictable.

The boat's cockpit is straightforward with two bolsters and a bench seat aft and a sun lounge on top of the engine hatch. The cabin has 6 feet 11 inches of headroom, facing lounges, a V-berth and a stand-up head.

Nova builds the boat with a foam core, infused vinylester resin and vacuum bagging. The cabin lounges and V-berth are liners. All through-bolts are installed with polymer bushings and backing plates to ensure that the coring can't get crushed when the nuts are tightened. So go ahead. Take the 39 Sport out in rough seas like we did. It's built to take it. — *Eric Colby*

WHO'D WANT ONE Offshore boat fans seeking the range and reliability of diesel engines.

ANOTHER CHOICE Willard Marine and Team Scarab build a diesel-powered 43-foot performance boat called the 43 Assault ($595,000 with twin Cummins 600 hp diesels and Trimax surface drives). It's a twin-step bottom that runs around 75 mph.

BOTTOM LINE $550,000 (with twin Volvo Penta D6-370 DPs); novaboats.net

BOATING Certified Test Results

	SPEED		EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
900	6.65	7.65	4.60	1.45	1.66	910	1048	1	78
1200	8.86	10.20	5.40	1.64	1.89	1034	1190	3	82
1500	9.73	11.20	6.50	1.50	1.72	943	1086	5	87
1800	15.38	17.70	7.10	2.17	2.49	1365	1571	6	84
2100	22.16	25.50	10.30	2.15	2.48	1355	1560	3	90
2400	26.89	30.95	13.80	1.95	2.24	1228	1413	2	88
2700	31.37	36.10	18.20	1.72	1.98	1086	1250	2	90
3000	35.50	40.85	23.70	1.50	1.72	944	1086	2	94
3300	39.54	45.50	32.40	1.22	1.40	769	885	2	95
3550	43.14	49.65	35.60	1.21	1.39	764	879	2	96

MOST ECONOMICAL CRUISING SPEED

▶ **LOA:** 39'3" ▶ **Beam:** 11'0" ▶ **Draft:** 2'4" (drives up)
▶ **Displacement (approx.):** 9,200 lb.

HOW WE TESTED

ENGINES: Twin 370 hp Volvo Penta D6-370 Duoprop sterndrives
PROPS: G7 26-inch-pitch nibral propsets **GEAR RATIO:** 1.63:1
FUEL LOAD: 230 gal. **WATER:** 25 gal. **CREW WEIGHT:** 350 lb.

PHOTO: COURTESY NOVA BOATS

Calcutta 263

WE SAY The Calcutta 263 is a sweet ride with plenty of stability in rough seas for bottomfishing and trolling. Its skinny 14-inch draft makes it a great bay boat as well. Next, its fuel economy with test power is likely unbeatable: 3.5 miles per gallon at 26 miles per hour. Even at 35 miles per hour, though, it clocks 2.4 miles per gallon, getting you on the fish fast for minimum dollars. While many cats tend to heel outboard in turns, this one behaved much better than most, holding near level footing with the wheel hard to port or starboard.

With livewell options and plenty of rod stowage, it's clearly a hard-core fisher, but the beefy boarding platform steps makes it a great dive platform too. The folding transom can lie flat, giving divers clear egress from sole to ladder. If you want to just hang out on the hook, add sun pads for the bow deck. Added convenience comes from the space inside the roomy helm station. A head is an available option ($1,200).

It's clear from visiting the factory that this boat is well crafted. Of particular note is the extremely organized layout of wiring; however, the batteries were uncovered, leaving the terminals vulnerable. The upper station with UFlex electronic controls adds $20,000 with hardtop but makes it ideal for hunting fish. Each Calcutta is custom built to order so you can have it your way. — *Randy Vance*

WHO'D WANT ONE Anglers weary of compressed disks from pounding seas.

ANOTHER CHOICE Prowler 25 ($86,000 base with dual 140s, plus $7,000 for the upper station).

BOTTOM LINE $109,900 (base with test power); calcuttaboats.com

BOATING Certified Test Results

	SPEED		EFFICIENCY					OPERATION	
rpm	knots	mph	gph	naut. mpg	stat. mpg	n. mi. range	s. mi. range	angle	sound level
1000	3.69	4.25	0.77	4.80	5.52	540	621	0	68
1500	5.30	6.10	1.37	3.87	4.45	435	501	0	73
2000	7.04	8.10	2.53	2.78	3.20	313	360	1	76
2500	8.65	9.95	3.67	2.36	2.71	265	305	2	79
3000	14.64	16.85	4.97	2.95	3.39	331	381	3	85
3500	18.81	21.65	5.94	3.17	3.64	356	410	2	87
4000	22.59	26.00	7.53	3.00	3.45	338	388	1	89
4500	26.46	30.45	10.18	2.60	2.99	292	337	1	89
5000	29.98	34.50	14.15	2.12	2.44	238	274	1	91
5500	33.89	39.00	17.32	1.96	2.25	220	253	1	93
6000	37.93	43.65	23.11	1.64	1.89	185	212	1	95

MOST ECONOMICAL CRUISING SPEED

▶ **LOA:** 26'3" ▶ **Beam:** 8'6" ▶ **Draft:** 1'2" ▶ **Displacement (approx.):** 2,800 lb. (plus motors)

HOW WE TESTED

ENGINES: Twin 140 hp Suzuki DF140 **DRIVE/PROP:** Outboard/ Suzuki 14" x 22" 3-blade stainless steel **GEAR RATIO:** 2.59:1 **FUEL LOAD:** 55 gal. **CREW WEIGHT:** 325 lb.

PHOTO: EMILY CAMPAGNA

WE ALREADY KNOW WHAT
FLOATS YOUR BOAT

CELEBRATING 25 EZ DOCK 25 YEARS

EZ PONTOON LIFT

EZ PONTOON LIFT with PWC LIFTS

EZ DOCK®

DOCKS • LIFTS & PORTS • STORAGE • BENCHES • SWIM PLATFORMS • SLIDES

EZ PONTOON LIFT FEATURES:

- Versatile mounting options for multiple installation methods
- Durable marine-grade materials
- Modular system so you can easily expand or reconfigure your boatlift/dock by simply adding components
- Safe and easy-to-use platform design without any open areas or exposed metal
- Can be used with standard EZ Dock, traditional floating or fixed docks

VISIT US AT **www.EZ-DOCK.com** OR CALL **800-654-8168**

Big and Bold

MERCURY RACING'S 400R

SINCE MERCURY RACING HAD ALREADY BUILT A SUPERCHARGED, 350-HORSEPOWER outboard engine, the no-longer-available Mercury Racing 350 SCi, you'd think that the engine manufacturer wouldn't need to change much to develop a 400 hp model.

You'd be wrong.

"We made quite a few internal changes in the cylinder heads, camshaft, pistons, even the supercharger itself," said Mercury Racing General Manager Erik Christiansen. "This is a lineup extension. It's not a replacement for anything."

I ran four of the new 400R outboards on a Nor-Tech 390 Sport Open center-console with a twin-step V-bottom, and the acceleration with these motors was impressive. Motoring along at 75 mph, I nailed the throttles, and we hit 90 mph in seconds.

Christiansen explained that one of the biggest challenges with the 400R was feeding air to the supercharger efficiently. The new model's supercharger is similar to those in other Verado models, but the 400R's screw-type compressor is the first to be water-cooled. Because superchargers increase power by taking the air-fuel mixture and compressing it before it enters the combustion chamber, heat is a concern.

To feed air to the motor, Mercury Racing did away with the old ram-air-style cowling used on the 350 SCi. That cover had intakes on the front, while the new one has a cold-air induction system with a scoop on the rear. "The biggest deal is to get the air in as cold as you can," Christiansen explained. Not only does the new cowling deliver air to the supercharger more efficiently, but the cowling also makes the already quiet motor even more stealthy.

Displacement for the 400R is still 2.6 liters, and thanks to a new antiknock sensor developed by Mercury Racing, the engine can run on 89 octane, although the company recommends 91 octane or higher.

For improved stability when the boat is running at high speeds, the new motor has stainless-steel midsection guide plates with composite wear pads. The motor mounts are designed to work with the guide plates to provide the smoothest running characteristics possible. Electrohydraulic power steering and SmartCraft digital throttle and shift (DTS) make the driver's job effortless. You can even get the motor with joystick control for easier docking. With a 26-inch center lateral size, it can fit a variety of transoms.

The 400R is the first Verado to utilize Mercury Racing's Sport Master gear case with low-water pickups. These surfacing gear cases enhance performance for go-fast center-consoles, bay boats, flats boats, bass boats and, of course, high-speed V-bottoms. For single-engine applications, the 400R can be ordered with a Sport Master with a cambered skeg to counteract propeller torque. The skeg has a parabolic shape and is offset to starboard. Port and starboard cambered Sport Masters are required for boats equipped with Mercury's joystick piloting for

New Racing Outboard in Development

Working with teams from the highly competitive XCat class of offshore racers in the United Arab Emirates, Mercury Racing is developing a high-output, four-stroke race motor. This engine is a derivative of the 400R with a 15-inch midsection and dry sump lubrication. — *E.C.*

PHOTOS: (FROM TOP) COURTESY NAPLES IMAGE, COURTESY MERCURY RACING

PHOTO: COURTESY NAPLES IMAGE

Key Specs

HORSEPOWER: 400 **CONFIGURATION:** In-line-6 **DISPLACEMENT:** 2.6L **GEAR RATIO:** 1.75:1 **RPM RANGE:** 6,400 to 7,000 **DRY WEIGHT:** 668 lb. **FUEL REQUIREMENTS:** Recommended unleaded 91 octane (minimum unleaded 89 octane)

Price: $31,530

outboards. While the 400R comes standard with tie-bar mounts on the front for V-bottom designs, Mercury Racing came out with a rear mount for catamarans. For boats that need more bow lift, buyers can get the 400R with a 5.44-inch-diameter HD Verado gear case as well. The motor comes in 20-, 25- and 30-inch shaft lengths. The 20-inch shaft length model with a 5.44-inch gear case weighs 668 pounds.

The 400R is available in the traditional Phantom Black, but you can also get the 400R in seven different accent colors to match virtually any boat's graphics. While the white motors on the Nor-Tech looked good, I'm not sure I can get used to seeing a Mercury motor in any color except black. "It's probably 50-50ish," Christiansen said. "There are a lot of people in the world who want to see the white."

The motor has a retail price starting at $31,530, and Christiansen hinted that even at 400 hp, Mercury Racing might not be done. "One thing's for sure: You don't often hear people asking for less horsepower," he said. Bring it on.

— Eric Colby

Editor's Note

Many factors will affect anchor selection. Some are boat related, including an anchor's ability to stow or be deployed. Others relate to location and bottom composition, such as the anchor's ability to set and to reset itself during a tide swing. Furthermore, in bottoms of varying composition, the performance of different anchors will vary. Performance will also vary if the components of the anchor rodes are different. This test compares anchor performance in a mud-clay bottom only.

PHOTO: COURTESY FORTRESS/MARINE ANCHORS

HOLDING POWER

It's a function of design, construction and seamanship.

BY CAPT. JOHN PAGE WILLIAMS

WILL THE ANCHOR HOLD? Good question. Your life might depend on your answer. In a constant quest to evaluate anchor-holding power for its own products and the competition, Fortress Marine Anchors set up a rigorous test of 12 comparably sized, premium-brand anchors in typical mud/clay bottom of the Chesapeake Bay at Solomons, Maryland. Brian Sheehan and several other Fortress executives invited a dozen boating journalists to participate and "keep the testing honest" by carefully analyzing the methods and results over four days. Chuck Hawley, former vice president of product testing at West Marine and a videographer, recorded comments on each test (available at fortressanchors.com). Here's what we found.

METHODOLOGY

Testing order of the anchors was random. They ranged in weight from 21 to 46 pounds and were designed for cruising boats in the 35- to 40-foot length overall range. Our platform was the 81-foot research vessel *Rachel Carson*, owned and operated by the University of Maryland's Chesapeake Biological Laboratory at Solomons. With its twin 1,205 hp MTU diesels driving Hamilton water jets, 30 hp bow thruster, research-grade GPS (accurate within 0.0003 degrees) position-keeping system and 20 hp hydraulic winch with stainless cable, the big boat proved excellent for anchor testing.

The Fortress staffers and *Rachel Carson*'s skipper, Capt. Mike Hulme, picked out a broad testing area of mud/clay bottom in 26 feet of water. At a specific point (a *datum*), the deck crew placed each anchor overboard, and Hulme set off along a specific compass course (*azimuth*). When the scope reached 5:1, he proceeded another 100 feet and engaged position-keeping, jets and thruster keeping the vessel on station. Then first mate Rob Nilsen wound the anchor back in for 10 minutes (100 feet) with the winch. A tensiometer set into the cable's run measured the anchor's resistance (holding power) in pounds, recording it continuously on several linked computers in the vessel's lab room as the scope fell from 8.8:1 to 5:1. Then Hulme backed over the anchor, and the deck crew retrieved it.

For each pull, we watched the tensiometer plot resistance over time

Sonar as an Anchoring Aid

This exercise made me want to advise any cruising boater to buy a good sonar and learn to read what it tells you about the holding ground where you want to anchor. Firm bottoms return stronger echoes than softer ones, and the sonars on most of today's multi-function units display echo strength in a range of colors. No, you don't have to learn to interpret bait and predator signals the way fishheads do, but 15 minutes of close attention while prowling a range of familiar locations will get you started in reading bottom types. — *J.P.W.*

PHOTOS: (COUNTERCLOCKWISE FROM TOP RIGHT) CAPT. JOHN PAGE WILLIAMS (3), COURTESY GARMIN LTD.

LESSON ONE As Brian Sheehan said, "Any anchor can fail to set the first time on any given day."

ANCHORS

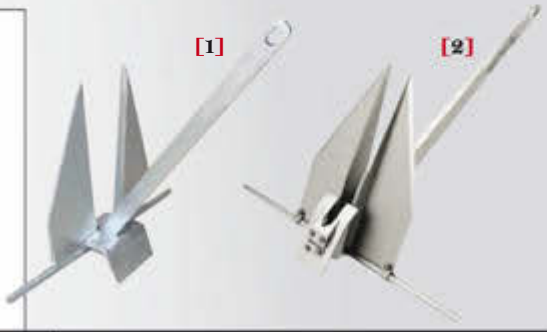
Here are the anchors tested, with weight and material noted. Each anchor was tested with 20 feet of ⅜-inch chain. They range from workaday galvanized fluke types to the elegant, polished, stainless-steel plow models, but all are carefully engineered to allow their owners to sleep soundly overnight (though posting an anchor watch is always good idea).

FLUKE TYPE

[1] Danforth HT
35 pounds — galvanized, high-tensile steel

[2] Fortress FX-37
21 pounds — corrosion-resistant, high-tensile aluminum/magnesium alloy

(Note that the skipper can set the flukes of the Fortress FX-37 at 32 degrees for most mud/clay bottoms and 45 degrees for very soft mud. We tested it in both configurations, so it counted as two different anchors.)



PLOW TYPE

[3] Lewmar Claw
44 pounds — galvanized, high-tensile steel

[4] Lewmar CQR
45 pounds — galvanized, drop-forged steel

[5] Lewmar Delta
44 pounds — galvanized high-grade manganese steel

[6] Manson Supreme
45 pounds — galvanized, high-tensile steel

[7] Manson Boss
45 pounds — galvanized, high-tensile steel

[8] Mantus
45 pounds — galvanized carbon steel plate

[9] Rocna
44 pounds — galvanized, high-tensile steel

[10] Spade 44 pounds — galvanized, high-tensile steel

[11] Ultra
46 pounds — high-tensile, polished stainless steel

PHOTOS: (COURTESY) TIE-DOWN ENGINEERING (DANFORTH HT), FORTRESS MARINE ANCHORS (FX-37), LEWMAR (CLAW, QCR, DELTA), MANSON ANCHORS (SUPREME, BOSS), MANTUS ANCHOR, ROCNA, SPADE ANCHOR, ULTRA

RESULTS

THE HOLDING POWER CURVES for five pulls of each of the 12 anchors (including two for the Fortress FX-37, set at 32 and 45 degrees) are available for viewing at fortressanchors.com. You'll note that Mike Hulme and the Fortress crew started at a new datum each day so that the anchors were worked through a fresh area of bottom.

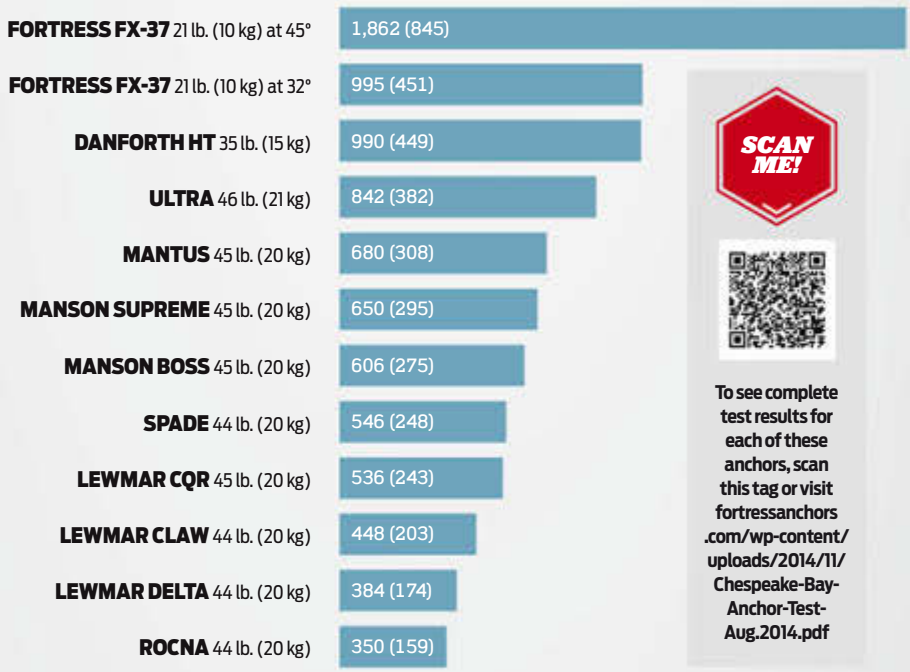
It was impressive to see how much the results could vary from set to set with the same anchor in the same area. Every anchor failed to set initially at least once, and several broke free partway through because of either debris on the bottom or a change in the bottom's composition.

During 54 pulls, the nine plow-type anchors held more than 1,000 pounds only twice. Their holding power peaked at scopes between 7:1 and 6:1. Several of the plow types showed reassuring consistency, helpful in a storm situation, where there is room to drag a little.

The highest holding power (more than 1,200 pounds) came from the fluke anchors, with the Fortress FX-37 set at 45 degrees (its soft-mud setting), peaking at 2,000 pounds. (At one point when it was in that range, the wake from a passing boat jostled *Rachel Carson* slightly, and the added force caused the breaker on the winch system to trip.) Note, though, that even that anchor delivered varying performance from pull to pull and within each pull.

We saw amazing variation in bottom consistency even in the relatively small area where we were working. I spent some time in *Rachel Carson*'s wheelhouse with Hulme, watching bottom signals on a Furuno FCV-585 sounder. The bottom hardness varied from firm clay to super soft, giving value to the protocol of averaging the results in judging each anchor's performance. — *J.P.W.*

AVERAGE MAXIMUM LOAD IN POUNDS (KG)



SCAN ME!

To see complete test results for each of these anchors, scan this tag or visit fortressanchors.com/wp-content/uploads/2014/11/Chespeake-Bay-Anchor-Test-Aug.2014.pdf

LESSON TWO

Anchor types have some similar behavior patterns.

as the winch plowed an anchor through the bottom. Then we crowded around to look at its condition and the bottom material left on it. Chuck Hawley and the videographer recorded a summary after each pull. We writers scribbled notes. Afterward, Hulme returned *Rachel Carson* precisely to the datum, taking a different azimuth for the next anchor, to keep from plowing the same piece of bottom again and again. During four days, the crew tested each anchor five times.

The test protocol called for discarding fouled anchors in making the final judgment. Fate illustrated the wisdom of this provision on the first pull of the Fortress FX-37, when it broke free on long scope because, as we learned when it got back to the deck, it had picked up an oyster shell thick enough to jam between the flukes and the shank. The next day, another anchor picked up nylon line and a waterlogged stick.

THE RIGHT STUFF

So what do we take away from all of this research? You need the right anchoring gear and the know-how and experience to safely and securely anchor your boat. Check out these seven essentials.

1 There is no such thing as "set it and forget it" with anchors. As in baseball, where every pitch counts,

PHOTO: CAPT. JOHN PAGE WILLIAMS

each anchor set brings its own challenges.

2 Even with all of the data available, anchoring remains a blend of science and seamanship.

3 Always remember: "Any anchor can fail to set the first time on any given day."

4 Pay close attention to the specific area of bottom where you plan to set your anchor. Learn to read the sonar signatures of mud, sand, shell and combinations of those materials. As a backup, "fly the lead pigeon," dropping a lead weight with a sticky substance like wax on it to pick up a bottom sample.

5 Think about all of the conditions that could affect the area where you propose to anchor, including depth, shoreline, other boats, "dragging room" and predicted wind.

6 If you, your family and your boat are going to depend on your anchoring systems for everything from a carefree lunch and a good night's sleep to survival in a major storm, learn all you can about anchoring. There's a lot of information out there ranging from the Anchoring Information tab on the Fortress website to the classic *Chapman Piloting & Seamanship* (67th Edition, 2013, $30 to $40 from amazon.com).

7 Finally, go boating. Put in your time on the water; learn from both your experiences and your conversations with other skippers; integrate all of it and put it to work for your boat, your family and yourself.

LESSON THREE
Pay attention to the bottom type. Know what you're setting your anchor into.

Defender Industries, defender.com. Enter *lead-line* in the search box, and you'll find a marked 98-foot Plastimo line with special weight, $48.99.

PHOTO: COURTESY DEFENDER INDUSTRIES

Two Is Better Than One

Always carry at least two anchors. Start with a main one whose rated holding power matches your boat's length, beam and displacement. Add a lighter "lunch hook" for short stays and fishing. Having the lunch hook will also allow you to set both to hold a precise position, if necessary. Oh, and make sure you have a secure storage place aboard for each anchor before you buy it. — *J.P.W.*

Anchor size recommendations are for boats of average windage and proportions, 30 knots of wind, average bottom conditions, and moderate protection from open seas. For storm conditions, we recommend using an anchor one or two sizes larger. Chart and data are courtesy of Fortress Anchors.

FORTRESS MODEL		FX-7	FX-11	FX-16	FX-23	FX-37	FX-55	FX-85	FX-125
Boat Length	(ft.)	16-27	28-32	33-38	39-45	46-51	52-58	59-68	69-150
	(m)	5-8	8-10	10-12	12-14	14-15	16-18	18-21	21-46
Weight	lb. (kg)	4 (1.8)	7 (3.2)	10 (4.5)	15 (6.8)	21 (9.5)	32 (14.5)	47 (21.3)	69 (31.3)
Replaces Steel Fluke Anchors	(lb.)	6-9	10-13	14-18	19-28	33-50	50-65	70-90	100-170
	(kg)	3-4	5-6	6-8	9-13	15-23	23-29	32-41	45-77
HOLDING POWER									
32° Hard Sand Holding	(lb.)	2,800	3,600	5,000	8,000	12,000	16,000	21,000	27,000
	(kg)	1,270	1,630	2,270	3,630	5,440	7,260	9,530	12,250
45° Soft Mud Holding	(lb.)	840	1,080	1,500	2,400	3,600	4,800	6,300	8,100
	(kg)	380	490	680	1,090	1,633	2,180	2,860	3,670
32° Soft Mud Holding	(lb.)	420	540	750	1,200	1,800	2,400	3,150	4,050
	(kg)	190	250	340	540	820	1,090	1,430	1,840
SUPPORT HARDWARE									
Proof Coil Chain	in. (mm)	3/16 (5)	1/4 (6)	5/16 (8)	3/8 (9)	3/8 (9)	1/2 (13)	1/2 (13)	1/2 (13)
Nylon Rope	in. (mm)	3/8 (9)	3/8 (9)	1/2 (12)	5/8 (16)	3/4 (18)	7/8 (22)	1 (24)	1 1/4 (32)
Shackle Size	in. (mm)	1/4 (6)	1/4 (6)	5/16 (8)	3/8 (9)	7/16 (12)	1/2 (13)	5/8 (16)	5/8 (16)

Use three-strand nylon rope and a minimum of 6 ft. (2 m) of chain for every 25 ft. (8 m) of water depth. Be sure to use enough chain and rope for a minimum 5:1 scope.

HOW MARINE OIL IS MADE

Just what are the qualities that make marine oil special?

BY CHARLES PLUEDDEMAN PHOTOGRAPHY BY MICHAEL SCHOENECKER

I am not a tribologist.

But I play one for this story. Which is why I'm wearing the lab coat and using a pipette to apply a smidge of oil onto the sample carrier of a Spectroil M spectrometer.

A tribologist is a mechanical engineer who specializes in issues of friction and lubrication, a person you want on your team when cooking up a crock of marine oil. That was my mission when *Boating* decided to participate in the blending and bottling of a batch of four-stroke engine oil, tracing the process from wellhead to gallon jug.

PHOTO: COURTESY MERCURY (LUBRICANT)

Marine engine oil is a substance essential to just about any boating mission. It's also a frequent topic of dockside discussion and queries from our readers, who ask, "What makes marine oil so darn special?"

To answer that question, I hooked up with a real tribologist, Frank Kelley, the guru of lube at Mercury Marine. Conveniently, I embarked on this assignment just as Mercury began to bottle its new four-stroke marine oil. So I not only got to "make" a gallon of the Mercury 25W-40 4-Stroke marine engine oil, but also got to learn a lot about the science behind a modern lubricant.

No original equipment manufacturers (OEMs) of marine engines are in the business of manufacturing their own oil. That's handled by a specialized lubricant formulator, in this case a business located in Minnesota.

A trip to the west Texas well of origin was not in the budget, so I'll instead skip the refining process and start my story beside a black 26,000-gallon rail tank car parked behind the oil-blending facility. The rail car hauls base stock, the foundation component of lubricating oil, from refineries in Texas, Mississippi or elsewhere. Base stock is refined to one of four groups. Groups 1 and 2 are called mineral base. Group 3 is more highly refined and called synthetic. Group 4 is polyalphaolefin (PAO), the most refined, and most expensive, base. The Group 1 base is yellow and stinks but is currently more expensive (though traditionally, it's cheaper). More refined base stock becomes clear, odorless, pure hydrocarbon. According to Mercury, the new Merc 25W-40 is a blend of mineral and synthetic base stocks in a ratio that achieves the desired viscosity and durability.

The base stock often used to blend the Mercury oil is pumped from the ground as "west Texas light sweet" crude and is always sourced from the same Texas refinery. The refining process and even the well the crude comes from can affect the properties of the base stock, so it's constantly tested. The first sample comes right out of the lid on top of the rail car. The Spectroil M uses a crackling plasma energy source to reveal the basic elements of the oil, which are compared to a baseline.

A viscosity bath is used to measure the sample's viscosity, the fluid's resistance to flow, which changes with temperature. In the lab, a tribologist measures viscosity at 100 degrees C and at 40 degrees C (212 and 104 F), literally timing how long it takes a specific volume of oil to pass through a very small orifice. Those results are expressed in centistokes (cSt), which are then converted to the SAE scale we see on the bottle — 30-weight, 40-weight, etc. A low-viscosity oil flows when it's cold to protect the engine on start-up but gets very thin when it gets hot. A higher-viscosity oil protects the engine at operating temperature. A multiviscosity oil, like the Merc 25W-40, behaves like a 25-weight oil when it's cold but has the protection of a 40-weight oil when it's hot. One way to achieve this broad viscosity range is to blend viscosity modifier additives with the base oil. The polymeric molecules of viscosity modifier additives get larger as they get hot to increase the oil's viscosity. However, viscosity modifier molecules are also very

FRANK KELLEY

Frank Kelley, an expert in tribology, fluids and corrosion, worked in research at Caterpillar for 28 years before joining Mercury Marine in 2003. He also serves on the National Marine Manufacturers Association Oil Certification Committee.

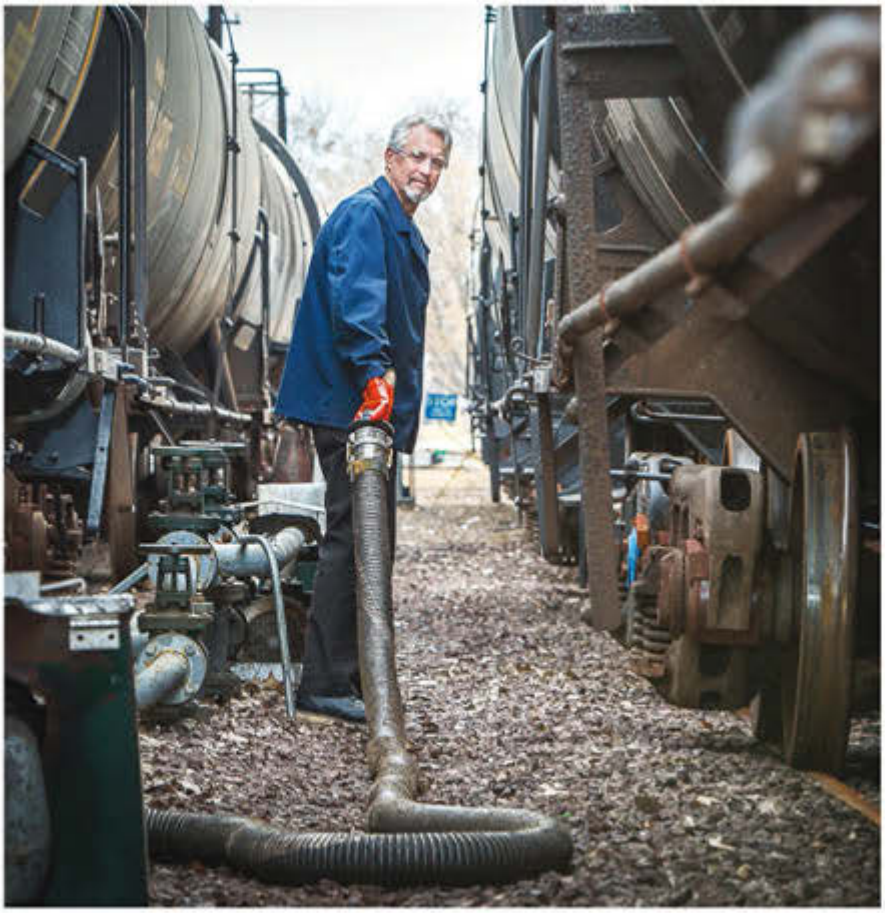


ILLUSTRATION: (OPPOSITE) SHUTTERSTOCK

THE GROUP 1 BASE IS YELLOW, STINKS AND IS EXPENSIVE. MORE REFINED STOCK BECOMES CLEAR, ODORLESS, PURE HYDROCARBON.

prone to shearing — they are literally cleaved by mechanical forces. As they are repeatedly sheared, these modifier molecules become less and less effective, and the oil gets thinner and thinner.

By blending different mineral and synthetic base stocks, the new Mercury oil formula achieves its multiviscosity character without the use of viscosity modifiers, and is thus much less prone to shearing than an oil that uses these additives. That exact formula is a closely held secret, but Kelley says the new oil retains 99 percent of its original viscosity through its service life. Mercury settled on the 25W-40 viscosity range because "that's where the protection is," Kelley says.

If its contents pass that first test, a large hose drains the base stock into a series of 20,000-gallon vessels inside the building, part of an indoor tank farm laced with pipes, valves, controls and gauges. There are literally thousands of additive options, with new additives being devised each year. Additives add wear protection, inhibit corrosion, disperse carbon deposits and enhance oxidative stability. Oxidative stability, simply put, means the oil will produce fewer deposits of varnish and sludge. The chance to reformulate with new additives was one reason Mercury chose to engineer a new four-stroke oil. The goal was to develop a single additive package that could be used in Mercury

WEST TEXAS LIGHT SWEET

West Texas Intermediate (WTI) also know as Texas Light Sweet, is described as "light" due to its low density and "sweet" because of its low sulphur content. Its is lighter and sweeter than other oil markers such as Brent Crude from the North Sea, Dubai Crude or Oman Crude. It is the benchmark oil used by the New York Mercantile Exchange to establish oil futures contracts. — *C.P.*

REFINED FACTS

Steam injected into an inner liner of the rail car warms the base stock to a flowable state for unloading during the Minnesota winter.

Only about a half-gallon of base stock can be derived from a 42-gallon barrel of crude.

The Mercury Marine facility in Fond du Lac, Wisconsin, uses 100,000 gallons of oil each year to factory-fill new engines.

outboards and MerCruiser engines and that would be compatible with legacy products, as well as the latest catalyst-equipped engines, and work well with modern gasoline. Collaborating with its supplier, Mercury blended and tested many new formulas. Each went through engine durability testing and through some special oil "torture" tests, the most critical being a hot-cold-hot-cold cycle in a 60 hp motor that simulates long periods of idle or trolling, to see how the oil handles fuel dilution and water contamination from condensation. Cost is also a concern, but like other OEMs, Mercury says it is willing to make very little profit on its oil in order to offer a superior product. Chemists at the supplier told me that OEM oil invariably tests at the "high end of the scale" because an OEM oil has to back up the engine product. The supplier also stressed that each OEM oil product is quite specific to the needs of that brand's engines.

"Customer satisfaction always has to come first," Kelley says of that specificity. "That final formula is backed not only by the brand, but also literally by the signature and reputation of the engineer who approves it."

Mercury says its new additive package offers 33 percent more wear protection and features a new corrosion inhibitor. The new additives are exclusive to Mercury. There are two versions of the Mercury 25W-40 formula, the standard and the synthetic blend. Both have the same additive package, but the synthetic blend has synthetic base stock and is thus more durable in extreme conditions — wide-open throttle for hours in a big Verado, for example.

Blending the oil is a big chemistry project, done in special blend tanks that circulate the base stocks and additives together with a 360-degree motion. This step requires a lot of precision because some additives need to be blended in stages and some are added only at a certain temperature. The finished blend is transferred to 8,800-gallon fill tanks that feed the bottling line.

Bottling oil, I'm guessing, is not much different from bottling ketchup. There's a big tank full of product; a machine squirts the product into bottles

AS THICK AS MOLASSES?

Viscosity is measured by timing the flow of an oil sample through the glass tubing inside this 40 degree Centigrade (104 F) constant-temperature bath.

PHOTOS: COURTESY MERCURY (OIL, ENGINE)

and screws on a cap, and the bottle is dropped in a box. During my visit, gallon jugs of Mercury oil were on the line. I helped take empty black jugs from a big box and line them up on a conveyor that carried the jugs to the filler. There, an overhead manifold feeds 12 fill tubes, and a jug comes to rest right under each tube. When the line is started a tech calibrates the filler, gradually filling a jug until it weighs 7.8 pounds on a scale. Then he throws a switch and the fill line takes off. Next, each jug enters a device that screws on a cap that also holds a foil seal. Heat is applied to the cap to weld the seal to the mouth of the jug. The front and back labels are applied simultaneously, along with a date code, and the filled jugs collect on a round stainless-steel table. I'm instructed to inspect the labels for wrinkles before dropping three jugs into each cardboard box. Oil is also packaged in quart bottles and in steel drums.

There's constant quality control in place. The oil is scrutinized in the lab after the blend process is complete, again before bottling, and finally at the end of the run. One sample bottle or jug from each run is saved as a reference along with samples of the additives used in that blend batch. These are filed away in a warehouse, and if there were ever an issue down the road, oil from the dealer shelves or a failed engine could be compared to the benchmark, using the date code. That same testing can reveal that a failed motor was not filled with Mercury oil, or not even with FC-W marine oil, in which case a warranty claim may be rejected. There is no fooling a tribologist and the Spectroil M.

BOTTLING OIL, I'M GUESSING, IS NOT MUCH DIFFERENT FROM BOTTLING KETCHUP. THERE'S A BIG TANK FULL OF PRODUCT; A MACHINE SQUIRTS THE PRODUCT INTO BOTTLES.

MARINE VS. AUTO OIL

The basic standard for four-stroke marine engine oil is the FC-W (four-stroke cycle, water-cooled) certification, which was approved by the National Marine Manufacturers Association Oil Certification Committee in 2004. Compared with regular motor oil, FC-W oil features:

More corrosion inhibitors to deal with the marine environment, long periods of inactivity and long periods of operation at low speeds during which the engine is below its ideal operating temperature.

Greater resistance to shearing, the permanent loss of viscosity that occurs when larger oil molecules are cleaved by mechanical forces. Under shear stress, oil can lose its ability to separate moving parts, leading to greater wear or even catastrophic failure in extreme cases. Compared with an auto engine, a marine engine spends much more time at high rpm and under a heavy load, so its oil is more prone to shearing.

An independent lab certifies that marine oil meets the FC-W spec, a test that takes 30 days and costs more than $55,000. The FC-W certification is sort of a "bare minimum" for oil performance. The FC-CW oil sold by engine OEMs significantly exceeds that minimum standard. — *C.P.*

ILLUSTRATIONS: SHUTTERSTOCK

ILLUSTRATION: TIM BOWER (MAIN), FREEPIK.COM (EXCLAMATION BUBBLES)

BY RICHARD JOHNSON

7 Things Radar Does Better than Other Marine Electronics

Mention the word *radar* and most boaters naturally think of collision avoidance. I have my own story about how radar saved me and my family while boating in the Pacific Northwest last summer, when a dense fog enveloped us midway across the Strait of Juan de Fuca. One minute we could see, and the next we were blind. A blip on the radar display indicated a fast-moving object heading directly toward us. After monitoring for a few minutes, I determined we were on a collision course and that the target was coming at us very fast. We cut speed and altered course, keeping our eyes glued to the radar screen to make sure we created enough space between us and whatever was inbound. A moment later, a fast-moving cruiser charged out of the swirling fog, flew past 50 yards off our bow and disappeared again in the cloud bank. Had it not been for radar, we probably would have collided.

I'M ALL ABOUT USING RADAR

for warning us about collision avoidance, which is the first thing that radar does better than other marine electronics. But radar can also do six other things that no other electronic navigation device (GPS, chart plotters and AIS) can do. Here's the scoop, starting with a review course in the capabilities of navigation technology.

GPS

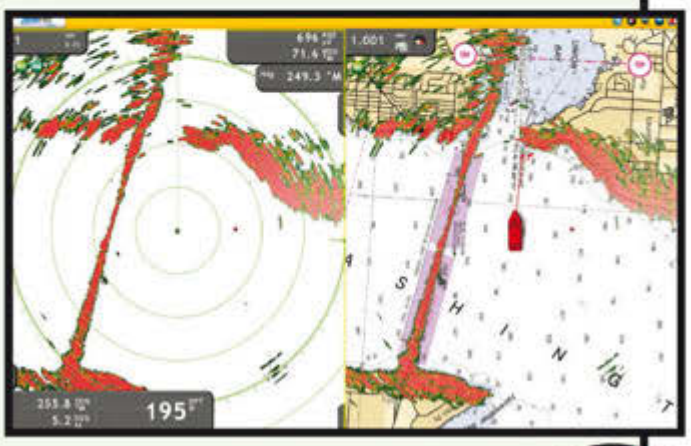
(Global Positioning System) is a multiple-satellite-based tracking system that receives a signal from an onboard GPS device, triangulates that information among a cluster of satellites and then returns information to you about your position. This is good for plotting your coordinates so they can be matched to a chart. With that information, you can determine where you are in relation to other things on the chart. It also indicates your heading and speed over ground and allows you to mark waypoints toward which you can navigate.

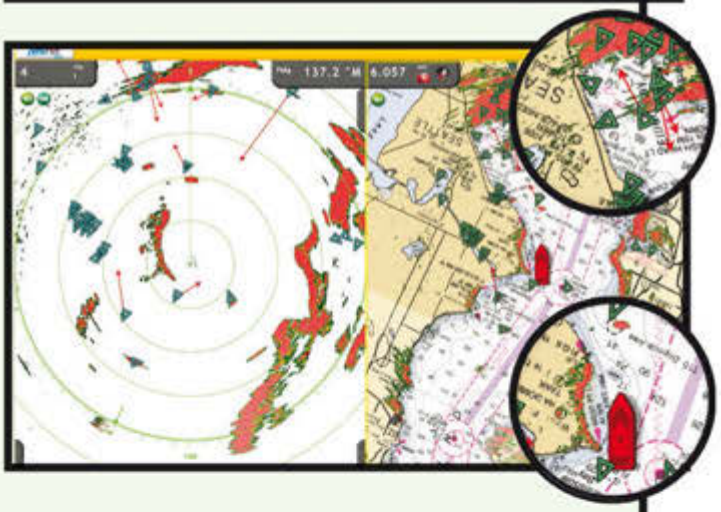
CHART PLOTTERS

are like GPS on steroids, showing your coordinates in relation to a digital chart. By using the cursor, you can plot waypoints, create a route and check coordinates of land features or aids to navigation (buoys, etc.). Some systems allow access to tide and current information and other bits of intel. The unfortunate truth about charts, whether paper or digital, is that they aren't always accurate. They are a representation of things the way they're supposed to be, but not necessarily as they really are. Explaining the reason for this would take a full discussion of cartography, which is beyond the scope of this article. Just realize that your GPS position on a chart is not necessarily a truthful representation of your actual distance from charted features.

AIS

(Automatic Identification System) is an active tracking system used on ships for transmitting their identity, position, course and speed. That's useful information, but in order to access that information you must have an AIS receiver on board and the other vessel must be actively using an AIS transponder. Large commercial vessels are required to use AIS, but even though receivers are becoming popular on pleasure boats, very few have AIS transmitters.



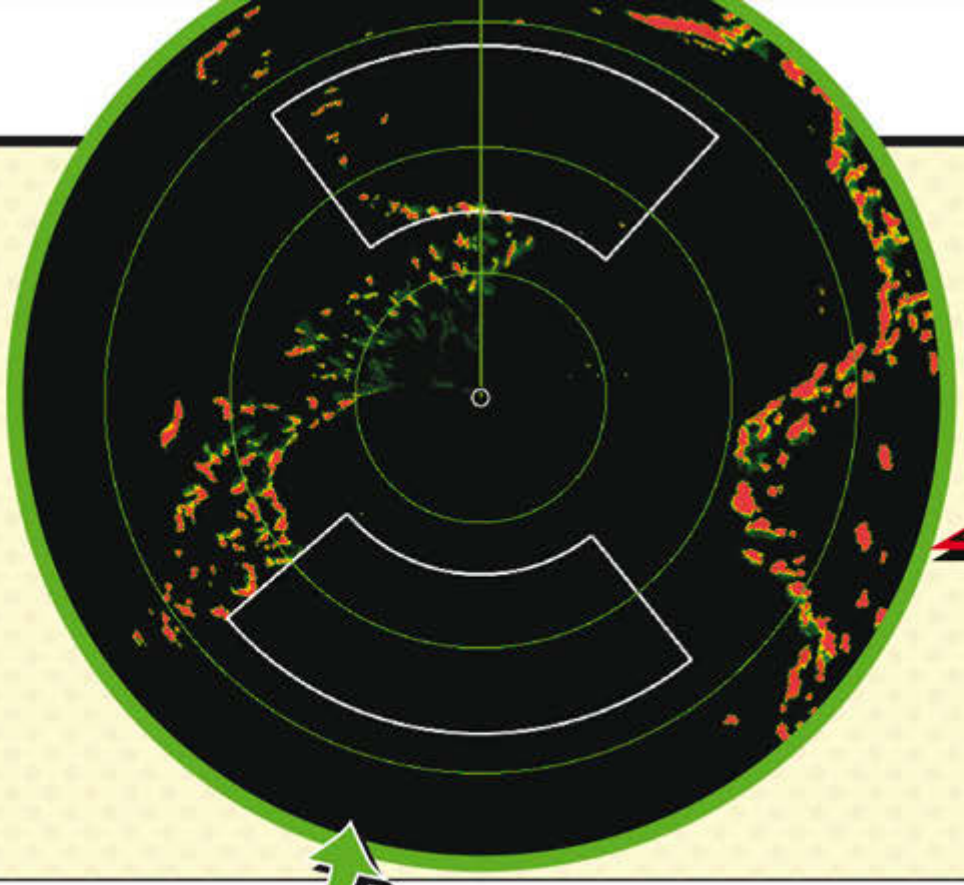


So, even if you have AIS on board, you won't be able to see any boat that doesn't operate a transmitter — like the boat that almost ran us down!

GPS, CHART PLOTTERS AND AIS ARE VALUABLE

for the limited functions they perform. Note, though, that none of them can help prevent a collision with uncharted objects (boats without AIS transmitters, floating debris, uncharted rocks, buoys that have drifted off station, etc.). Radar, on the other hand, doesn't need the target to do anything except exist. Unlike AIS, it doesn't require boats to transmit a signal for you to see them. Systems such as miniature automatic radar plotting aid (MARPA, also called ARPA — automatic radar plotting aid) allow you to identify a target, monitor its course and speed (as well as your course and speed in relation to the target), and identify the closest point of approach (CPA) and the time to the closest point of approach (TCPA). Danger alarms can be set to alert you if a target penetrates a guard zone that you establish around your boat. This combination of functions is the ultimate in collision avoidance technology.

PHOTOS: COURTESY FURUNO USA



SEE WHERE YOU CAN'T

Now, let's look at what radar can do for you that none of the other stuff can match. Let's begin with the ability to see where you can't. From the deck of your boat, the visible horizon is not very far. Let's assume that, standing on deck, your eyeballs are 10 feet above the waterline. From that elevation, the visible edge of the earth on open sea is only 3.88 miles. The formula for calculating distance (in miles) to the apparent horizon is d=1.23 times the square root of the height (in feet) of your eyes above the water.

In contrast to that, radar can see over the horizon. The radar horizon is about 15 percent farther than the eyeball-visible horizon, because the radar's microwaves are less subject to atmospheric deflection than the light that allows human eyes to see. In the above case, with you standing on the deck of your boat scanning the horizon, that 15 percent adds more than a half-mile. And because radar scanners are mounted higher than human eyeballs, the distance to detectable targets is increased even more.

Beyond a certain distance, human eyes will fail to be able to detect even large objects that are peeking above the horizon, but radar is not limited in the way eyeballs are. Let's say a fast-moving boat with a flybridge height of 12 feet above the waterline is heading your way. Even though you might not be able to see it, a radar antenna mounted 10 feet above the waterline will be able to pick up that target at a range of 8 miles (more than double the distance to your visible horizon). Not only that, but radar will be able to track the target's course and speed, so you can make collision avoidance decisions well in advance.

PHOTO: COURTESY FURUNO USA; ILLUSTRATIONS: PINKMOUSTACHE.NET (ARROW), FREEPIK.COM (COMIC WOMAN AND EXCLAMATION BUBBLES)

GLOSSARY!

HORIZONTAL BEAM WIDTH

The angle of the radar transmission. A narrower HBW makes for better target resolution, better target separation and longer range. Objects within the horizontal beam width will paint on the screen, which helps guide installation location and angle.

KILOWATTS (kW)

The output power of the radar set. More power can equal more range, generally, but other factors, such as horizontal beam width, apply. Also, newer digital radar has made this metric less meaningful since digital signal processing enhances radar target reception without the need for a lot of power.

MARPA/ARPA

A handy aid that highlights a specific target that a radar paints. While systems vary, basically you place the radar cursor over the target you wish to track and call up MARPA from a menu: The tracking and data display is automatic.

OPEN ARRAY

An exposed radar antenna that rotates

PAINT

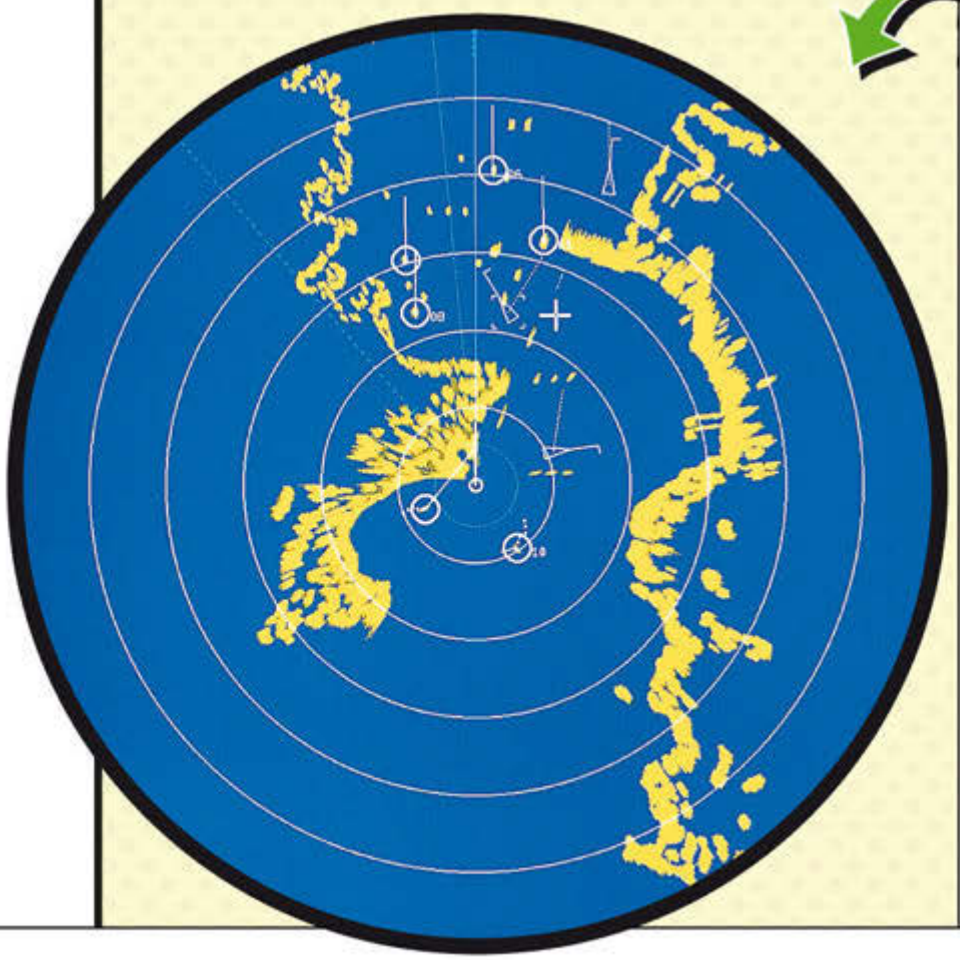
A target that shows up on the radar screen is said to be "painted." (My radar is painting the buoys clearly.)

DO YOU NEED A HEADING SENSOR?

A heading sensor (such as this Humminbird AS GPS HS) is an electronic compass that updates a boat's heading information faster than most GPS devices can, though some GPS antennas serve as heading sensors. Heading sensors can enhance the performance of radar, especially when using MARPA to track a painted target. They can also enhance the performance of autopilots and other marine electronics. A heading sensor is required if you want to create radar/chart plotter overlays.

SEE WHEN YOU CAN'T

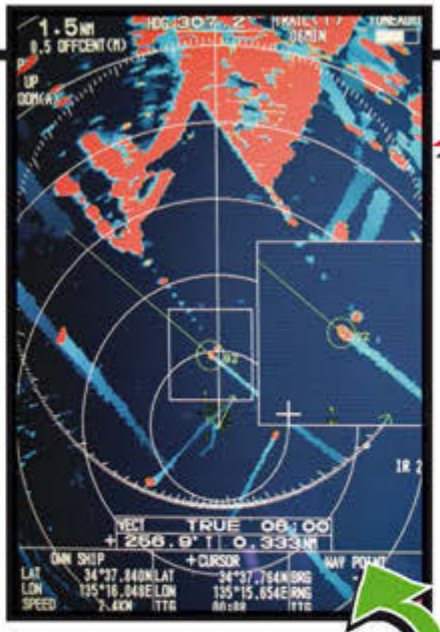
Visibility is compromised by darkness, fog (even a faint haze) and precipitation. This is when some boaters deceive themselves by thinking they'll be safe as long as they follow their GPS or chart plotter route from waypoint to waypoint. The problem is that, when following a GPS or chart plotter route, it isn't the charted land that will probably kill you — it's the uncharted objects like other boats and floating debris that can send you to the bottom. This is when the superhero eyeballs of radar really earn their keep, seeing through visual obstructions to help you know what's out there that you need to avoid.



FIND A FISHING SPOT

Let's say you spot a target on your radar display, and it's standing still or moving at trolling speed. You grab a binocular and scan the distant boat, recognizing it as a fishing vessel with lines in the water. Better yet is if there is a cluster of targets, all relatively motionless — a bunch of fishing buddies. As you watch, one fish after another is reeled aboard, and you know this is a hot spot you'll want to remember. The most successful fish catchers keep their favorite spots secret, but you have a secret weapon of your own. If you know your own coordinates, you can use the radar VRM (variable range marker) and EBL (electronic bearing line) to determine the exact distance and direction to the target fishing boat. Then it's easy to chart the coordinates of that prime fishing ground for future reference. Modern radar systems that are linked to your GPS also allow you to scroll the cursor over to the target and directly obtain a GPS coordinate for your new favorite fishing hole. While it's true you could purloin a secret wreck from a boat equipped with — and broadcasting — AIS, with radar you can capture any distant vessel's position.

PHOTOS: (CLOCKWISE FROM TOP LEFT) COURTESY HUMMINBIRD, COURTESY FURUNO USA (2); ILLUSTRATIONS: PINKMOUSTACHE.NET (ARROWS); (OPPOSITE) PHOTOS: COURTESY FURUNO USA; ILLUSTRATIONS: PINKMOUSTACHE.NET (ARROWS), FREEPIK.COM (COMIC WOMAN AND EXCLAMATION BUBBLES)



GRAB A WAYPOINT

That same technique can be used to grab a waypoint for any object that shows up on the radar screen. I once spotted an unknown target on the radar that turned out to be a dead whale floating on the surface. Using the radar functions, I was able to determine coordinates and relayed that information to the Coast Guard as a hazard to navigation.

WEATHER ALERT (SQUALLS)

Radar sensitivity can be adjusted to indicate rainsqualls in the distance, allowing you to analyze whether or not they are bearing down on your position. That might prompt you to batten down the hatches, take evasive action, and initiate whatever heavy-weather tactics you decide to use to keep your boat and your crew as safe as possible.

ENHANCED SITUATIONAL AWARENESS

On our boat, radar is used even during clear weather and bright sunshine, because it enhances situational awareness, alerting us to the fast boat overtaking from astern or coming from an obtuse angle. Without having my head on a swivel, constantly looking over my shoulder, the radar shows potential danger like no other navigation device.

Although radar has been around for more than 75 years, it's still the best technology for marine collision avoidance, plus it has additional functions that can't be matched by any other piece of marine electronics.

GLOSSARY!

RACON
An aid to navigation fitted with a transponder that causes an extraordinarily detailed target to paint (display) on the screen of a radar set

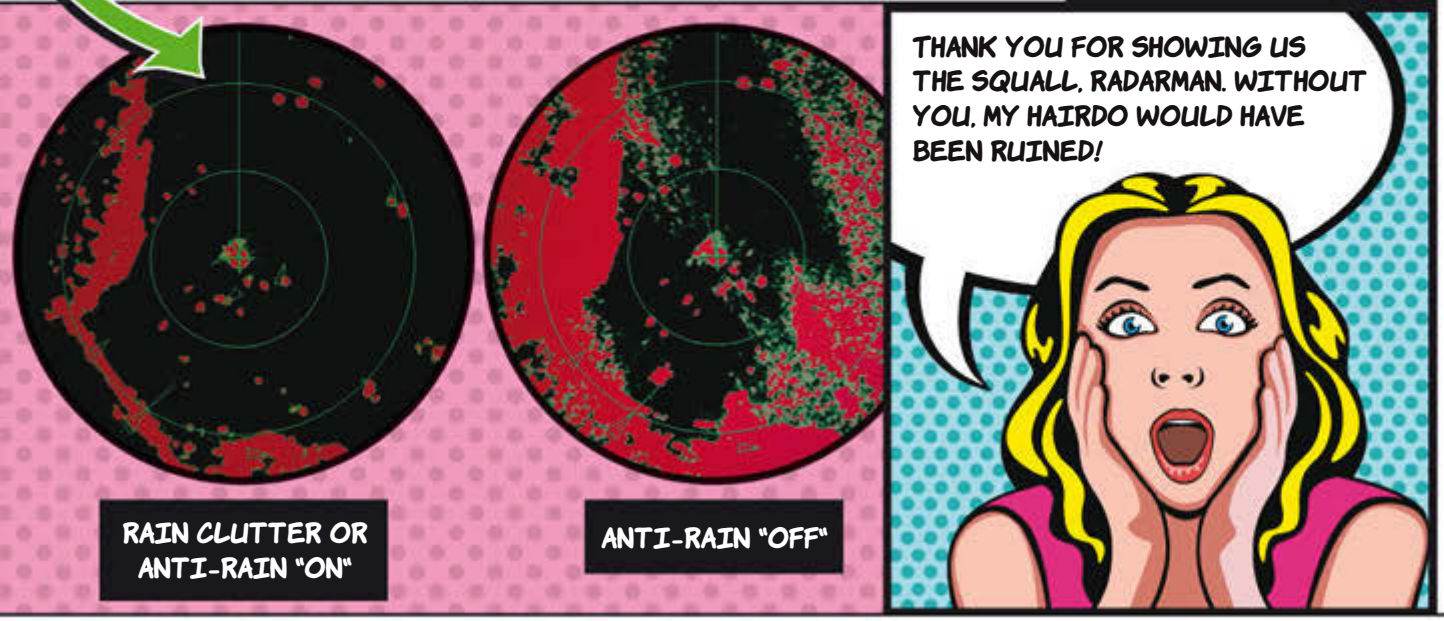
RADAR
Radio detection and ranging

RADOME
A radar antenna that rotates within a closed case, or dome

TARGET
An object that reflects microwaves transmitted by the radar and appears on the screen

TARGET RESOLUTION
The ability of a radar to detect and display targets

TARGET SEPARATION
The ability of a radar set to display ("paint") individual targets that are close together as distinct and separate targets



Electronics

Simrad Halo Radar

In the past, skippers could choose a long-range pulse radar with power-sucking magnetrons that required minutes of warm-up time. Or they could get a solid-state, instantly on, digital radar, dubbed "Broadband Radar" by Simrad, with excellent short-range target definitions. – ***Randy Vance***

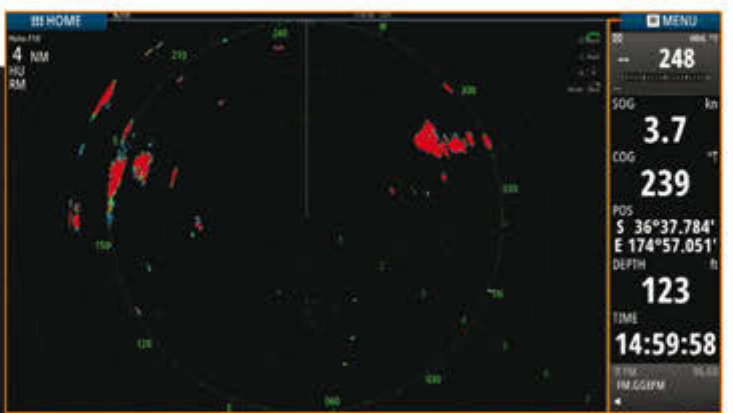
Thanks to Simrad's new Halo series, there's no longer a need to compromise. This open-array system offers spectacular target detail ranging from 20 feet to 72 nautical miles.

Halo uses pulse compression, a term describing its ability to transmit concentrated bursts of energy at long distances or define targets at close range.

Perhaps most remarkable is its ability to offer both views from the same array, on split screens or multiple displays. In addition, each view can be controlled and adjusted separately.

Adjustments are as simple or complex as you prefer. Use the automatic Harbor, Offshore, Weather and Bird modes or create custom settings to see targets your way. The radar uses only 6 watts of power and is warmed up in less than 30 seconds. Magnetron free, it is also radiation safe to all.

It's compatible with Simrad's NSS Evo or NSO Evo displays. Radars come in 3-, 4- and 6-foot arrays ($4,500, $5,000 and $5,500, respectively). Its brushless motor drive with helical gears is silent and durable. The sculpted base is blinged up with dimmable, internal, blue LED lighting.



For the Birds

The first thing any fishing boater asks a radar vendor is "Can it spot birds?" In the past, finding birds required a long-pulse radar with a powerful magnetron that needed lots of juice and big warm-up times. These systems compromised imaging of navigation targets, hiding them in the sea clutter required to spot birds. Safety also was compromised.

Simrad's new Halo radar is going to be very popular among anglers for answering that deficiency. With it, skippers can monitor and separately control two screens on their displays. Each screen boasts individual controls too. So anglers can adjust one to an offshore setting and the other for birds. — *R.V.*

Ask Ken

Q Last season I had to turn back to port twice because of electronics failure. What can I do to minimize such equipment failures?

A I suggest some simple benchmarks to verify that your marine electronics are working before you leave:

1. Make a radio check to confirm you are transmitting and receiving properly.
2. Confirm your position dockside with your GPS. Make a range and bearing check with a known point of reference. Know how many satellites you normally receive and their strengths. This will tell you if your GPS is operating normally.
3. When leaving, make sure your autopilot has no difficulty holding a course and responding to steering commands.
4. Check your radar by viewing familiar targets on long and short ranges to make sure that they appear normal.

These simple benchmark checks can also serve as an early warning of possible pending failures. — *Ken Englert*

ASK KEN ONLINE

For more exclusive electronics content, visit boatingmag.com/askken.

PHOTOS: (COUNTERCLOCKWISE FROM TOP CENTER) COURTESY SIMRAD (3), CRAIG HASHIMOTO

DIVE IN TO A LOW-INTEREST BOAT LOAN.

BANK OF THE WEST | BNP PARIBAS GROUP

Essex Credit, a division of Bank of the West, has affordable boat loan options that can help you get out on the water quickly. Our experienced consultants make getting your loan easy and stress-free, so you can look forward to what's really important — enjoying your boat. Changing market conditions can affect rates, so act now to take advantage of our low APRs.

Loan Amount	APR* as low as	Refinance — New or Used Purchase From a Dealer or Individual Seller — Purchase Locally or Cross-Country
$50,000+	4.12%	
$25,000–$49,999	4.79%	

APR is fixed for the life of the loan. Lower rates with shorter loan terms are also available. Rates are accurate as of May 22, 2015. See our website for current rates and terms for financing Live-Aboards, older boats and loan amounts below $25,000.

Apply online today.
www.essexcredit.com/boating
(866) 377-3948

ESSEX CREDIT
NEW - USED - REFINANCE

WE ALSO OFFER: Live-Aboard financing | Loans for older boats (1919–1994) | Loans for part- and full-time charters

*Estimated APR (Annual Percentage Rate). Subject to consumer loan program requirements and credit approval. Certain fees, closing costs, and restrictions may apply. APR applied to the loan is the APR in effect on the date the application is received and is valid until 30 days after the loan is approved. APRs may vary with loan term. Boat must be 1995 model year or newer and have a maximum loan-to-value of 90%. Maximum loan term based on model year, loan amount, loan type, and lender guidelines. Other rates with different loan terms are available. Example of a recreational use Boat loan: A 15 year fixed-rate $55,000 loan. Based on an APR of 4.12%, this loan has 144 monthly payments of $484.75 each.

Short Casts

Fishing Trends

The annual ICAST (icastfishing.org) fishing tackle trade show always showcases a wealth of new products for anglers, ranging from scented lures and new electronics to the latest rods and reels. That's why we attend. However, an overview of the past few ICAST shows reveals some definite trends in products designed for recreational fishermen. Three macro trends that we see are presented here. – *Jim Hendricks*

1 **SMALLER, LIGHTER BIG-GAME REELS** The advent of microthin yet superstrong braided lines means you no longer need an 80-wide reel for the line capacity to land a big tuna or marlin. Reel brands such as Okuma, Penn and Shimano now offer small, light two-speed reels with high-strength gears, beaucoup line capacity and drags that offer incredible stopping power.

2 **ANGLER-DEDICATED APPAREL** A growing number of companies, such as Aftco, Huk, Pelagic and Salt Life, offer clothing lines dedicated to the recreational angler. Not only are the clothes functional in terms of pocket storage, ventilation and ultraviolet protection, but they also offer attractive styles — shirts, shorts and pants that look great on the boat but also let you announce your avocation at the next cocktail party.

3 **AGE OF THE SUPER COOLER** Yeti got it started with coolers it debuted at ICAST that exceeded all previous expectations for keeping ice frozen and food and drinks cold. Yeti's success has ignited a proliferation of superinsulated coolers with each show from companies such as Engel, Coleman, Frigid Rigid, Orca and Pelican.

Raymarine eS Series by FLIR

Take control with the hybridTouch touch screen or utilize the sculpted keypad and rotary selector when using the Raymarine eS Series multifunction displays. Available in 7-, 9- and 12-inch sizes starting at $1,099.99; flir.com/marine — *Kevin Falvey*

Night Lights

From striped bass in the Northeast to snook in south Florida, if you find the right lights, odds are you'll find hungry fish. Here are five keys to successfully fishing lighted docks and bridges. — *Pete McDonald*

BRIGHT LIGHTS
Not every light on the water holds fish. The best dock lights are no higher than 6 feet over the water and either bright white or green. If they create a concentrated light pool in the water, bait will congregate inside it and predators will wait in the shadows to ambush them.

SHADOW LINES
Speaking of shadows, bridges with a well-defined shadow line will hold fish. For good results, anchor or position the boat up-current and send your baits or lures into the shadow line with the flow.

TIME AND TIDE
Some places fish better on the incoming, others the outgoing, but no matter what the water has to be moving for a good bite.

MATCH THE HATCH
Bait flowing through and congregating around light pools is typically on the smaller side, be it shrimp or crabs or baitfish. Ascertain what the fish are hitting in the lights and use a lure or bait of similar profile.

BEEF UP THE TACKLE
Hooked fish will use the dock or bridge pilings to their advantage. Use a heavier rig with a shock tippet that can withstand chafing.

PHOTOS: (COUNTERCLOCKWISE FROM TOP CENTER) COURTESY ENGEL COOLERS (2), COURTESY WICKED CATCH, COURTESY PELAGIC GEAR, COURTESY PENN FISHING TACKLE MANUFACTURING CO., COURTESY RAYMARINE, TOM SCHLICHTER

Star brite

STAR TRON®

CURES & PREVENTS ETHANOL FUEL PROBLEMS

MAXIMIZE

POWER • PERFORMANCE • FUEL ECONOMY

- *Stabilizes Fuel For Up To 2 Years; Engines Start Easy & Without Smoky Exhaust*
- *Provides Maximum Performance, Even from Ethanol-Blended Fuel*
- *Removes and Prevents Gum, Carbon and Varnish Deposits*
- *Keeps Fuel Injectors and Carburetors Clean*
- *Helps Prevent Phase Separation by Dispersing Moisture Throughout Fuel as Submicron-Sized Droplets that Can Be Safely Eliminated as Engine Operates*

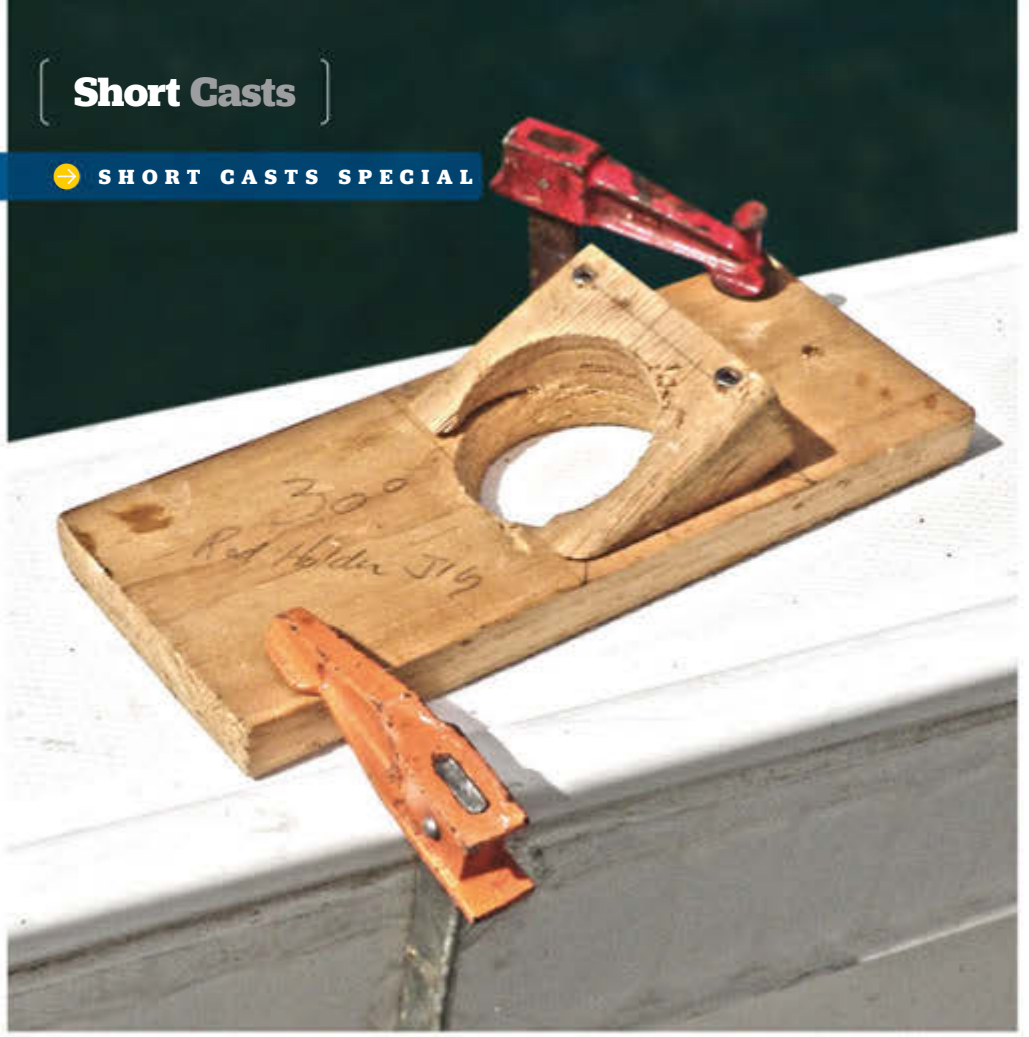
RECOMMENDED FOR USE IN ALL
OUTBOARD & INBOARD ENGINES

SCAN FOR INFO

OTHER RECOMMENDED USES

WWW.STARTRON.COM

FOLLOW US ON



A Jig for Cutting Rod Holder Holes

Cutting and drilling holes to add accessories are tasks about which many boaters express fear. Usually, my response is "Don't worry: Your boat is full of holes already." If you want the GPS, the stereo, the swim step or the transducer, you've got to drill a hole. Adding rod holders is no exception, but they require a twist. – *Kevin Falvey*

Since rod holders are angled, the hole they fit through must be angled as well. When a spinning hole saw hits the surface at an angle, it wants to "walk" off to the side — chewing up the pretty fiberglass in the process. Worse, you could lose control of the saw and break your wrist because the drill will turn and buck as the saw bites in. So you have to control this sharp, madly spinning device while maintaining a constant angle so that the rod holder fits through the covering board or gunwale and its flange lies flush when installed.

The best way I have found to do this — and I have been installing rod holders for over 30 years — is by the use of a simple jig that anyone can make. A crusty old salt named Bill, from Bill's Boats, Port Washington, New York, showed it to me back in the 1970s. I have used various versions ever since. For this article, I cobbled up a quick one to provide you with a step-by-step guide to building your own. It's not the only way to make such a jig, but its basic premise of holding the saw at the correct angle, and in the right plane side to side, ensures a safe and secure rod holder installation. No worries about your boat's finish. No need to break out the medical kit.

It took me an hour to build the one shown here, complete with some cosmetic flaws. But even if you've never built one before and you don't have a shop full of tools at the ready, it's no more than a pleasant evening's task.

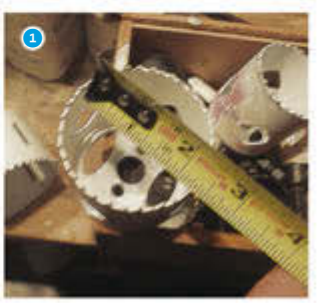
If you think building a jig is cheating, I suggest you speak to a pro. Any carpenter or boat rigger worth his tool chest will tell you he uses jigs and patterns at every opportunity. "By eye" is the method for hacks.

1 Select the appropriate size hole saw. Rod holders come in 2- and 2¼-inch diameters. Here I'm making a jig for 2¼-inch rod holders, so I select a 2¼-inch hole saw.

2 Select a two-by block of scrap material, mark a center, and cut the hole. I would normally use a drill press for this, but here I just used a drill. You want a clean, vertical-sided hole.

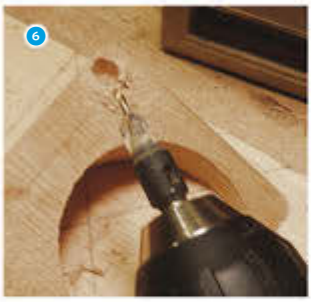
3 Rod holders come in 30, 15 and 0 degrees. Here I am making a jig for installing 30-degree holders. I set the miter saw angle at 30 degrees and clamp the stock with the hole in it on its side in the saw. (The miter saw was on hand; a band saw works better.) You could use a bevel gauge to mark the stock and cut carefully by hand, but I rarely do stuff by hand if there's a machine available.

You can see that my 7-inch miter saw isn't big enough to quite get all of the circle at 30 degrees in 2-inch-thick stock. But we have enough of it, as will be shown.



PHOTOS: KEVIN FALVEY






QUICK TIP

If you can't get a purchase for a clamp in the cockpit, pipe clamps can be used to bear against gunwale and chine to secure the jig.

4 Trim the block to a manageable size, enough to leave room for driving screws through this "cutting block" into the other component that needs to be made and that we'll call the "clamping block." When fastened together, these two parts make the completed jig. I'll trim this block at the marked line shown and then we will proceed.

5 After trimming the piece, select a scrap of half-inch to three-quarter-inch-thick solid wood or plywood. Place the cutting block (the part with the hole in it) on top of the new scrap (clamping block) so that the angle is up; that is, so that the hole presents itself at 30 degrees, not vertically. Just turn the bloody thing upside down as shown!

Measure and mark for center and then drill holes for screws — being careful you don't drill into the cavity of the cutting block. If you look closely you can see where I squared up a pencil line from the bottom , forwardmost part of the hole on the outsides of the cutting block. Then I connected these lines across its top. So long as I drill above the line that I marked, and vertically, the screws won't end up in the hole.

6 Countersink the holes for the screws.

7 I switch to my impact driver. If you have one, it provides much better control while driving screws than a drill motor does. If you don't, a driver bit chucked in a drill is fine. You could easily drive the screws by hand as well. I used stainless square-drive screws, but galvanized or ceramic deck screws would work too. Be careful selecting the length of the screws. If they are long, place some scrap underneath so you don't screw the fixture to your bench! You can file off the protruding tips later.

8 Once the cutting block is fastened securely to the clamping block, you'll need to carry the angled hole through the clamping block. Here, I switch back to the drill motor with the hole saw. With the "hole block" as a guide, I cut through the clamping block, in effect making the same cut I would on the boat when installing rod holders.

For the record, I call this the clamping block because this flat plate under the cutting block allows the jig to be clamped to the gunwale in position over the mounting location.

The clamping block may have to be modified — cut and/or shaped to fit around obstructions like cleats and rail stanchions, and so that it can lie flat if there is a fuel fill or spray rail or whatever on the gunwale. This is why I don't glue and screw the cutting block to the clamping block when making these jigs. Consider the clamping block "sacrificial" — to be modified as required to suit a particular mounting location.

9 Here is how it works on the boat. Like this — get it? I'll run two more screws into the shallow end of the hole block to prevent the "rise" evident in the heel of the cutting block in this photo. Then add a coat of paint so it'll last while being used in a marine environment.

A jig like this can be made in various ways, with a variety of materials. My method is just a good baseline. The important thing is that using such a fixture ensures accurate cutting on the boat. It takes a lot longer to repair chewed-up fiberglass, and at much greater expense, than it does to cobble together a hole-cutting jig.

PHOTOS: (FROM TOP) KEVIN FALVEY (6), COURTESY PERKO INC.

Perko Clamp-On Rod Holder

Made of chrome-plated bronze this Perko rod holder is sturdy and durable and requires no drilling. It features a smooth, black liner and can be mounted at any angle. Size DP0 fits rails to 1-inch diameter; size DP2 fits 1¼-inch rails. $98; discountmarinesupplies.com — K.F.

BOATING LAB

BY RANDY VANCE

Vessel Security Options

Boat owners are happiest on their boat and second happiest when they know it is safe. Over the past year, we've seen many products designed to help boaters know all is well with their vessels. These gizmos have ranged from ones as simple as a motion-activated lipstick-tube camera to satellite-communication systems monitoring entryways and bilge water, maintaining a geofence around the boat and, on some, even letting you peek on board if something has gone awry.

Here are a handful of contenders to consider and the process by which we evaluated them.

IZon

View

$99.99; IZONCAM.COM

SERVICE FEE: FREE

A little larger than a lipstick tube, the camera's concave bottom fits magnetically to a convex base. Fasten it to an overhang or set it on a flat surface. The motion-activated camera shoots full color in daylight and infrared images at night. The image can be flipped for upside-down mounting. You get free video storage for up to 100 events and up to 25 event notifications daily.

OUR EXPERIENCE

We downloaded the iZon app and plugged in the camera. The handy QR code activation process didn't work on our camera — and this was the second experience like that. No matter, following manual setup, we had it up and running in three minutes. We immediately got emails and text messages when it activated and then more when it detected noises above the sound threshold we'd set. Birds chirping would set it off, so we deactivated sound activation. The motion detection window is easy to customize in the app by pinching the translucent window over the camera image. We set ours to avoid capturing stray cats. Careful positioning avoids false alarms while keeping the camera at sentry watching only the area you need to protect. Images were surprisingly crisp and night vision was remarkable. Notifications of intrusion with video links were nearly instantaneous.

POWER DEMANDS: 120 to 240 volts

AN APP FOR THAT?: IOS and Android apps give full connectivity to the cameras for real-time viewing and to display security breach videos.

WISHES: We wish it were weatherproof.

TECH SUPPORT NOTES: We didn't need tech support but called as a test.

TIME TO TECH SUPPORT: We left a message and got a call back in 17 minutes.

GEOFENCE TEST: It notifies of motion in the view frame, letting us know someone entered or pulled the boat away.

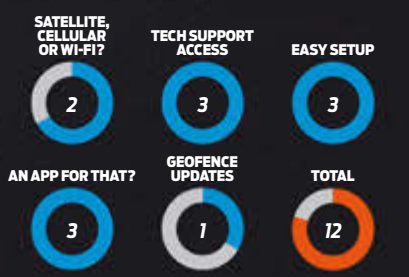
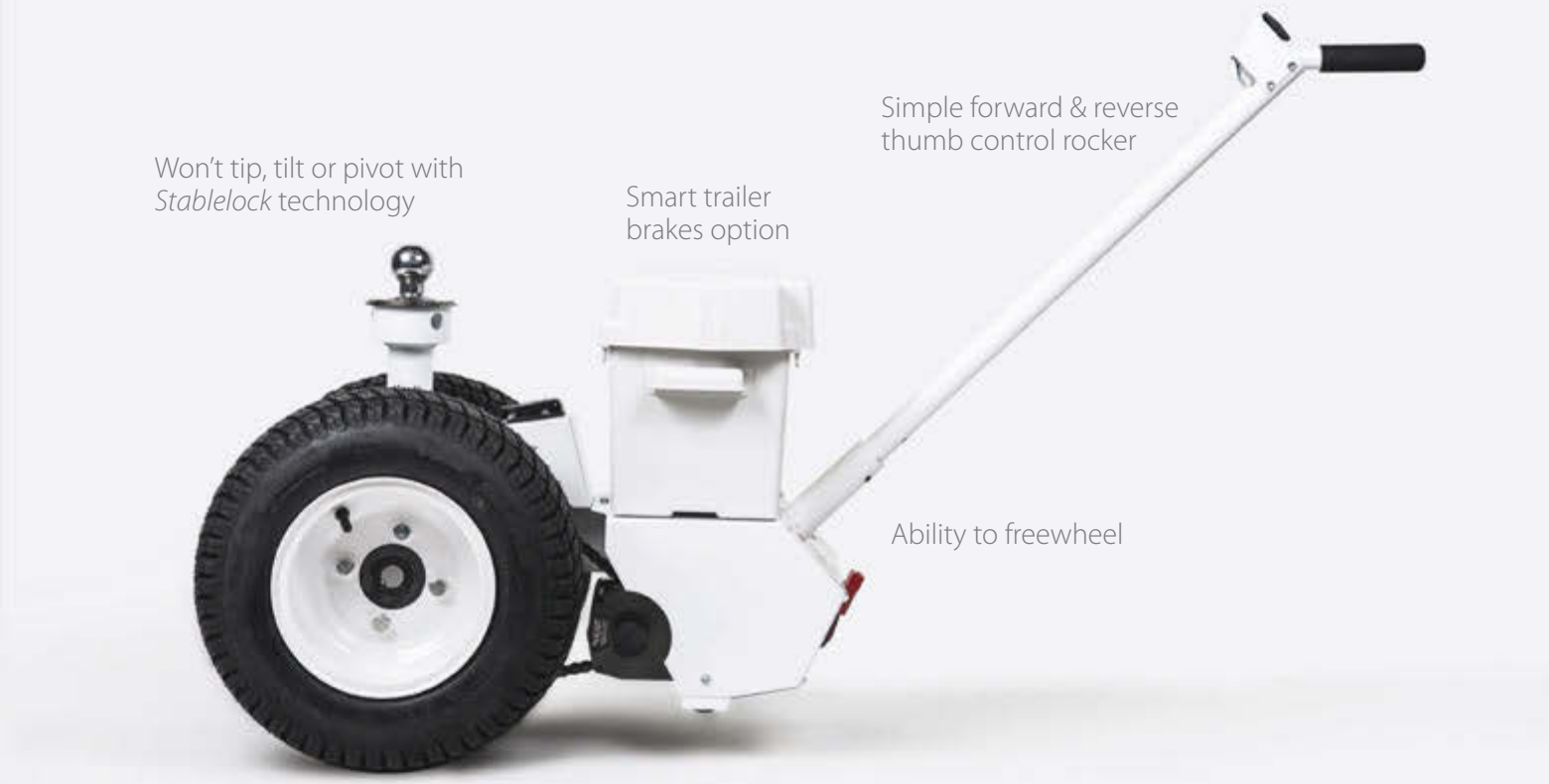


PHOTO: BILL DOSTER

Parkit360°

Move any trailer with our compact, powerful, battery-powered trailer dolly.






Model shown (Force) supports: Tag-Along and Pintle
Transformer supports: Gooseneck, 5th Wheel, Tag-Along and Pintle

www.parkit360.com
1-888-926-5517

To view online tracking, visit boatingmag.com.

HOW WE TESTED

SATELLITE, CELLULAR OR WI-FI?

Vessels capable of cruising overseas need satellite communication to be tracked offshore. Cellular range is most economical for inland vessels, and Wi-Fi is usually useful in the marina. The devices we tested used at least two of these communication bands to offer maximum security for our test vessel. We gave three points to the products that used all three bands and fewer points for those using fewer bands.

Wi-Fi, Satellite and Cellular: 3
Satellite and Cellular: 2
Wi-Fi Only: 1

TECH SUPPORT ACCESS

Not one of these devices is exactly plug-and-play easy to install. The good news is that tech support was easily available for them all. Some answered their tech support line instantly, and some within a reasonable wait of a couple of minutes. We awarded points as follows:

Instant Access: 3
Short Wait: 2
Unreasonable Wait: 0

EASY SETUP

Could the average, everyday, computer-savvy user set this up single-handedly?

Yes: 3
With Tech Support: 2

AN APP FOR THAT?

App and Online Access: 3
Fully Addressable in an App: 3
Online Only: 2

GEOFENCE UPDATES

Email, Text with Location: 3
Email, Text When Geofence Is Breached: 2

Spot

Trace

$99.99; FINDMESPOT.COM/TRACE
SERVICE FEE: $99.99 TO $199.98

This satellite system is the size of a Zippo lighter, so it can be hidden anywhere in the boat as long as only a layer of fiberglass or plastic comes between it and the stars. Its snap-on bracket can be glued or screwed in place. An accelerometer detects motion and notifies the owner via email or text message. Several contacts can be set. Notifications can be set at intervals of 2½, five or even more minutes. When the asset stops, another message is sent. Standby battery times number into weeks, while monitoring and reporting battery life is measured in hours and days. Hard-wiring the device to the battery makes more sense — if you can hide the power cable. Battery power will take over when external power is removed. Spot will text and email you when power is low.

OUR EXPERIENCE
This was the easiest of all devices to set up and maintain, owing partly to its single-minded mission of telling you where your remote asset is. We put our test device in our boat, hitched up and immediately got a notification of motion. Then our progress to the dentist and finally the office was monitored and reported.

POWER DEMANDS: 12-volt battery or three AAA batteries
AN APP FOR THAT?: iOS and Android
WISHES: We wish the waterproof 12-volt power cord were standard, not a $50 option.
TECH SUPPORT NOTES: The tech staff was knowledgeable and easy to reach.
TIME TO TECH SUPPORT: Instant
GEOFENCE TEST: It activates on motion, not geofence, but the unit often failed to notify us of the moment that motion was begun. Yet it did apprise us of changing locations.

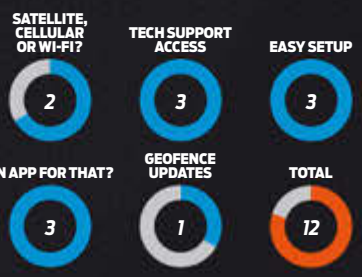


PHOTO: BILL DOSTER

NEW SELECTION SECURE DECK SEATING DESIGNS

INTERACTIVE SEATING • MULTIPLE TOW POINTS

COLOR FUN

WOW
WORLD OF WATERSPORTS

COLOR FUN

SECURE
DECK SEATING

SECURE SEATING FOR THE FAMILY

WWW.WOWWATERSPORTS.COM

www.facebook.com/towables

NEW INNOVATION ORIGINAL THINKING

FOR FAMILY LAKE FUN

COLOR FUN

WOW
FUN
1 YEAR
WARRANTY

SECURE
SADDLE SEATING

SECURE
COCKPIT SEATING

SUMMER
LAKE FUN

To view online tracking, visit boatingmag.com.

GPLink

GPLink

$4,200; GPLINK.COM

SERVICE FEE: $1,500 ANNUALLY WITH CONCIERGE

This security system's communication functions on cellular and satellite systems, opting for the cheaper connections when available. A concierge service helps monitor your vessel, following up with automated notifications in the most critical circumstances. The engine-monitoring system is most impressive, though we couldn't test it directly, lacking diesel power with digital communications ports. It communicated rpm, speed, fuel flow and many other engine running variables and fault codes in near real time to the GPLink site for remote monitoring. Our test system monitored AC power and bilge water levels. Entryway and motion sensors are among the many available.

OUR EXPERIENCE

This was by far the easiest full-security system to assemble and activate. We powered it with a paperback-size lithium-ion battery starter pack for two hours as we set off cross-country with the device activated below the coffin-box hatch of our boat.

It clocked our progress in real time via cellular networks beginning when we left our geofence. When cellular connections failed in the more remote "toolies" of south-central Florida, it engaged satellite service to maintain full tracking until the battery died — and it sent us voltage warnings as voltage diminished. All these notifications and our position on a chart were visible on the GPLink tracking Web page. Each notification included a location link. Bilge water levels used a more reliable electronic, not mechanical, float switch. A customized time delay can be set to allow bilge water problems to self-correct. The AC power sensor is simply plugged into any outlet. All censors communicated with the system wirelessly.

POWER DEMANDS: 12 to 24 volts, low draw

AN APP FOR THAT?: Under development

WISHES: We wish it would talk to gasoline inboards and outboards and offer a security camera option.

TECH SUPPORT NOTES: Not only were technicians knowledgeable, but they also knew us on subsequent calls.

TIME TO TECH SUPPORT: No waiting

GEOFENCE TEST: It's easy to establish a geofence and customize it to allow in-port operation for fueling or maintenance without deactivating it.

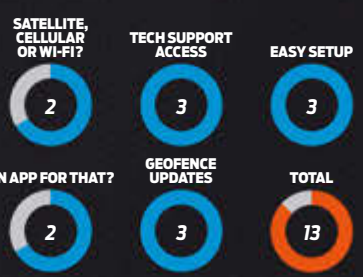


PHOTO: BILL DOSTER

QUADRANT SET

18 Carat Gold Plated Steel With Flawlessly Created Diamonds

Necklace: $139 Bracelet: $99 Set Price: $199 + S&P (Saving you $39)

Our latest Steel Collection of Jewelry for men combines a classic twist rope chain with contemporary boxed sections. These modern additions are in turn, each set with 5 of our flawless created Diamonds. These magnificent gems rate so highly on the Moh's scale of hardness that they can even cut glass like a mined Diamond. Each piece is expertly cast from premium grade Solid Stainless Steel before being fused with luxurious 18k Gold. Each item is presented to you in one of our magnificent presentation cases.

CALL OUR CREDIT CARD HOTLINE NOW, TOLL FREE 24/7 ON 1-877 550 9876

And Quote Promo Code:

30 DAY MONEY-BACK GUARANTEE

BOA157DRA

LIMITED STOCK AVAILABLE

OR order online at www.timepiecesusa.com/boa157 And Enter Promo Code **BOA157DRA**

Timepieces International Inc, 12800 N.W. South River Drive, Medley, FL 33178

To view online tracking, visit boatingmag.com.

GOST

NT-Evolution 2.0 SM/Watch HD

$4,999/$9,888; GOSTGLOBAL.COM
SERVICE FEE (MONTHLY): $36/$30

Our satellite-based GOST (Global Ocean Security Technologies) NT-Evolution test system ($4,999) informs you of your boat's status at all times. The Inmarsat M2M GPS monitors your boat's position and provides online 24/7 tracking. Set the geofence to include only your slip or your full marina, should you wish to allow staff to move the boat for maintenance, fueling or pump-outs. A voltage sensor, a bilge water-level monitor and an entry-point sensor offered more protection. Should any of these triggers (or any of the many optional ones) be tripped, automatic email and text messages update you on the vessel's status. An IP67 water-resistant housing protects the system.

Optional GOST Cloak, upon illegal egress, completely fills the vessel with an opaque, odorless, residue-free smoke to render intruders blind. Our test system also featured GOST Watch HD ($9,888) with two (of six max) security cameras that stream live from the vessel.

OUR EXPERIENCE

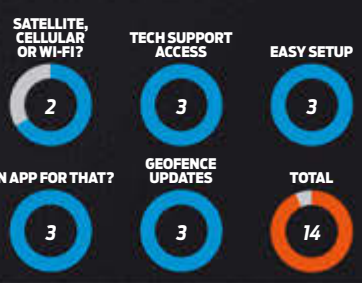
We assembled the components on a panel and powered them with a 12-volt jump-start battery for two to three hours. All the components were given their electronic "handshake" at the factory, so our job was just to plug them into the system and turn it on. In addition, we needed to log onto the website to designate emergency contacts, set the geofence and set preferences for alarm sensitivity.

We received notification when the system powered up and another when the battery was depleted. We were notified when a test hatch was opened and when our tester triggered the bilge float. When our boat drove away from home port, GOST tracked it in real time, so we could communicate with law enforcement on the vessel's whereabouts.

Eyeball cameras transmitted color video to our laptop via the website. When the FLIR M-Series camera is online, the owner can rotate the camera 360 degrees and 180 degrees up or down to inspect the vessel remotely.

All these features require a robust communication system, and that is a power gobbler. Ample 12- or 24-volt power at about 6 amps is required to keep the system functioning, making this best suited for long-range cruisers.

POWER DEMANDS: 12 to 24 volts, moderate 6 amp
AN APP FOR THAT? GOST Watch only
WISHES: We wish it were more compact and could function on less amperage.
TECH SUPPORT NOTES: Not only were technicians knowledgeable, but each team member also knew about our customized system and our call history.
TIME TO TECH SUPPORT: No waiting
GEOFENCE TEST: A 500-meter (1,640-foot) zone is easy to customize to allow in-port operation for fueling or maintenance without deactivating the device.



PHOTOS: BILL DOSTER

HARBOR FREIGHT

QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

How Does Harbor Freight Sell GREAT QUALITY Tools at the LOWEST Prices?

We have invested millions of dollars in our own state-of-the-art quality test labs and millions more in our factories, so our tools will go toe-to-toe with the top professional brands. And we can sell them for a fraction of the price because we cut out the middle man and pass the savings on to you. It's just that simple! Come visit one of our 550 Stores Nationwide.

SUPER COUPON

20% OFF

ANY SINGLE ITEM

LIMIT 1 - Save 20% on any one item purchased at our stores or HarborFreight.com or by calling 800-423-2567. *Cannot be used with other discount, coupon, gift cards, Inside Track Club membership, extended service plans or on any of the following: compressors, generators, tool storage or carts, welders, floor jacks, Towable Ride-On Trencher, Saw Mill (Item 61712/62366/67138), Predator Gas Power Items, open box items, in-store event or parking lot sale items. Not valid on prior purchases after 30 days from original purchase date with original receipt. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

88025306

SUPER COUPON

FREE WITH ANY PURCHASE

PITTSBURGH 6 PIECE SCREWDRIVER SET

LOT 47770 shown
61313/62570
62583/62728

$4.99 VALUE

LIMIT 1 - Cannot be used with other discount, coupon or prior purchase. Coupon good at our stores, HarborFreight.com or by calling 800-423-2567. Offer good while supplies last. Shipping & Handling charges may apply if not picked up in-store. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one FREE GIFT coupon per customer per day.

88022639

SUPER COUPON

SAVE 37%

"The Ideal Trailer Dolly" – RV Magazine

HEAVY DUTY TRAILER DOLLY

LOT 37510 shown
60533/69898

Haul Master

- 600 lb. Capacity

$49.99

REG. PRICE $79.99

88021918

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP

LOT 69249/69115/69137
69129/69121/877 shown

SAVE 55% $3.99

REG. PRICE $8.99

88015899

LIMIT 9 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

WOW SUPER COUPON

3 GALLON, 100 PSI OILLESS PANCAKE AIR COMPRESSOR

CENTRAL PNEUMATIC

LOT 95275 shown
60637/61615

SAVE 55%

$39.99

~~$59.99~~

REG. PRICE ~~$89.99~~

88016497

LIMIT 3 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

POWDER-FREE NITRILE GLOVES PACK OF 100

HARDY

- 5 mil. thickness

YOUR CHOICE!

$6.49

REG. PRICE $11.99

SAVE 45%

MEDIUM LOT 68496/61363

LARGE LOT 68497/61360

X-LARGE LOT 61359 68498 shown

88019272

LIMIT 8 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

WOW SUPER COUPON

10 FT. x 20 FT. PORTABLE CAR CANOPY

LOT 60728
69034 shown

SAVE $80

$119.99

~~$149.99~~

REG. PRICE ~~$199.99~~

88024814

LIMIT 3 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

NEW

6" VARIABLE SPEED DUAL ACTION POLISHER

CHICAGO ELECTRIC PLATINUM

LOT 62403
69924 shown

SAVE $72

$57.99

REG. PRICE $129.99

88018509

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

WOW SUPER COUPON

4000 PEAK/3200 RUNNING WATTS 6.5 HP (212 CC) GAS GENERATORS

PREDATOR GENERATORS

SUPER QUIET

- 70 dB Noise Level

SAVE OVER $205

LOT 69729/68528/69676 shown
LOT 69675/69728 CALIFORNIA ONLY

$294.99

~~$339.99~~

REG. PRICE ~~$499.99~~

88015606

LIMIT 3 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

MOVER'S DOLLY

- 1000 lb. Capacity

HaulMaster

LOT 60497/93888 shown
61899/62399

$8.99

REG. PRICE $14.99

SAVE 40%

88015929

LIMIT 6 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

RAPID PUMP® 3 TON LOW PROFILE HEAVY DUTY STEEL FLOOR JACK

- Weighs 77 lbs.

PITTSBURGH

LOT 68049/62326/62670
61282/61253 shown

SAVE $85

$84.99 REG. PRICE $169.99

88016586

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

130 PIECE TOOL KIT WITH CASE

PITTSBURGH

LOT 69331
68998 shown

SAVE 66%

$29.99

REG. PRICE $89.99

88019424

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

WOW SUPER COUPON

TRIPLE BALL TRAILER HITCH

HaulMaster

LOT 94141 shown
69874/61320
61913/61914

SAVE 66%

$19.99

~~$29.99~~

REG. PRICE ~~$59.99~~

88021970

LIMIT 4 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

SUPER COUPON

44", 13 DRAWER INDUSTRIAL QUALITY ROLLER CABINET

- Weighs 245 lbs.

US GENERAL

SAVE $330

LOT 68784 shown
69387/62270
62591/62744

$369.99

REG. PRICE $699.99

85022168

LIMIT 5 - Good at our stores or HarborFreight.com or by calling 800-423-2567. Cannot be used with other discount or coupon or prior purchases after 30 days from original purchase with original receipt. Offer good while supplies last. Non-transferable. Original coupon must be presented. Valid through 10/23/15. Limit one coupon per customer per day.

- 100% Satisfaction Guaranteed
- Over 25 Million Satisfied Customers
- No Hassle Return Policy
- Lifetime Warranty On All Hand Tools
- 550 Stores Nationwide
- HarborFreight.com 800-423-2567

WeatherTech®

American Manufacturing *Done Right!*

COMPLETE COVERAGE FOR YOUR VEHICLE

See our full line of Automotive Accessories at WeatherTech.com

No-Drill MudFlaps

BumpStep®

Hitch Mounted Bumper Protection

In-Channel

Side Window Deflectors

Designed in USA - Handcrafted in Germany

Accessories Available for

Acura · Audi · BMW · Buick · Cadillac · Chevrolet · Chrysler · Dodge · Ferrari · Ford · GMC · Honda · Hummer · Hyundai · Infiniti Isuzu · Jeep · Kia · Land Rover · Lexus · Lincoln · Maserati · Mazda · Mercedes-Benz · Mercury · Mini · Mitsubishi · Nissan Oldsmobile · Plymouth · Pontiac · Porsche · Saab · Saturn · Scion · Subaru · Suzuki · Toyota · Volkswagen · Volvo · and more!

Order Now: 800-441-6287

American Customers **WeatherTech.com**

Canadian Customers WeatherTech.ca

European Customers WeatherTechEurope.com

COMMITTED TO QUALITY

COMMITTED TO YOU

SEI : SECOND TO NONE

All SEI drives and parts are 100% OE compatible, and its reputation for state-of-the-art manufacturing combined with the most comprehensive quality control system and rigorous testing allows SEI to provide dealers and end users with the best warranty in the industry. It's this commitment to quality and to customers that makes SEI second to none.

3 YEAR FAULT FREE WARRANTY

COMPLETE STERNDRIVES starting at $1295

SEII6™ Complete shown, replaces MerCruiser's® Gen II I/O. Available in Lower, Upper, Complete* and Counter rotation. For our entire line of replacement Sterndrives please visit our site at ShopSEI.net

*Drives ship in two halves. Installation hardware kit or anode kit not included.

U-JOINTS

SEI uses heavy-duty, greasable U-joints.

OIL SEAL &GASKETS

SEI Marine Products has designed & source its own high performance line of these products.

LOWER GEARS

Our spiral bevel gears are cut on Gleason machines. The forward and pinion gears are made from a higher grade alloy to provide for extended life.

CASES

Our cases are CNC machined using a single fixture set up, providing precise alignment of all bores and other critical dimensions. All cases are chromate dipped and powder-coat painted, resulting in durable and corrosion resistant finish.

UPPER GEARS

Our spiral bevel gears are cut on Gleason machines. The forward and pinion gears are made from a higher-grade alloy to provide for extended life.

WATER PUMP ASSEMBLY

Our water pump impellers are made of high quality, long lasting neoprene rubber.

SHAFTS

SEI prop & drive shafts are friction welded bimetal. The gear box end of the shaft is comprised of hardened alloy 8620, while the shaftend exposed to the elements is 17-4PH stainless steel.

BEARING CARRIER

SEI Marine Products bearing carriers are made of die cast, anodized aluminum.

REPLACEMENT LOWER UNITS starting at $845

MARINE SEI PRODUCTS

YOUR GEARCASE & DRIVE SPECIALIST

813.925.7127 ShopSEI.net

No More Mister Nice Watch

Our digital-analog hybrid has two sides... tough and tougher. Get it now for an unbeatable $59!

Your watch shouldn't cost more than your car. It should look and feel like a tool and not a piece of jewelry. Wearing it shouldn't make you think twice about swinging a hammer or changing a tire. A man's timepiece needs to be ready for anything. But that's just my opinion. If you agree, maybe you're ready for the Stauer **Centurion Hybrid**. Say the word and I'll send it to you today for **ONLY $59.**

This watch doesn't do dainty. And neither do I. Call me old-fashioned, but I want my boots to be leather, my tires to be deep-tread monsters, and my steak thick and rare. Inspiration for a man's watch should come from things like motorcycles, firefighters and belt sanders. And if you want to talk beauty, then let's discuss a 428 cubic inch V8.

Did I mention the $59 price tag? This is a LOT of machine for not a lot of money. The Stauer **Centurion Hybrid** sports a heavy-duty alloy body, antiqued bronze-finished and detailed with a rotating bezel that allows you to track time and speed. The luminous hour and minute hands mean you can keep working into the night. And the dual digital displays give this watch a hybrid ability. The LCD windows displays the time, day and date, includes a stopwatch function, and features a bright green electro-luminescent backlight.

The band is accented with yellow stitching and the dial and second hand pop with that same memorable color. So go ahead, get to work on that engine or fire up the radial arm saw. This watch can keep up. The only problem you'll have is deciding whether to keep the Stauer **Centurion** on your dresser with your wallet and car keys or tucked inside your toolbox.

Your satisfaction is 100% guaranteed. Put the **Centurion** through the paces for 60 days. If for any reason you are not completely satisfied, simply return it to us for a full refund of your purchase price.

Stauer Centurion II Hybrid Watch ~~$199†~~
Offer Code Price **$59** + S&P **or**
two credit card payments of $29.50 + S&P Save $140

1-800-333-2045

Your Insider Offer Code: CBW113-01
You must use this insider offer code to get our special price.

Stauer®
14101 Southcross Drive W.,
Dept. CBW113-01
Burnsville, Minnesota 55337
www.stauer.com

BBB ACCREDITED BUSINESS
Rating of A+

† Special price only for customers using the offer code versus the price on Stauer.com without your offer code.

Dual movement • Antiqued bronze-finished case and rotating bezel • Water resistant to 3 ATM • Stopwatch, day & date complications • Cotswold™ mineral crystal • Black strap with yellow contrast stitching fits wrists 7" to 9"

Smart Luxuries—Surprising Prices™

Classifieds

Following Seas

By David Seidman

Weird Al

THE FORGOTTEN MAD GENIUS OF BOATING

To reduce drag, Albert Hickman got an idea for a surface-piercing propeller with no underwater gear.

EVER HEAR OF ALBERT HICKMAN? NO? WELL, I'M NOT surprised — almost no one has. But I am surprised that it's come to this, because he should be a boating legend.

Hickman was one of the first to achieve high speeds on the water without resorting to high power. He proved that by forcing air under a hull it could be made to go faster; he invented the surface-piercing propeller, designed and devised tactics for the first high-performance torpedo boats, discovered that propellers generate lift, was the first to use counter-rotating props, built the first high-speed aircraft carrier, and came up with the idea for lifting strakes, sponsons and the nontripping chine. And one of his designs was the inspiration for the Boston Whaler. Pretty impressive stuff.

Hickman started tinkering in 1906, building a 20-foot boat that made 14.3 mph with only 7 horsepower — a record for such little power. He then added side plates at the chines to trap air under the hull, which made it faster. To reduce drag, he came up with a surface-piercing propeller with no underwater gear.

His first props got the 20-footer well past 20 mph. He then took a break and did some creative thinking, and what he came up with and displayed at the 1913 New York Motor Boat Show couldn't have been more unusual. As a reporter put it, "Any resemblance to a boat could not be recognized."

It looked like a V-bottom boat that had been cut down the centerline and reassembled so the original sides were in the center and centerlines on the sides. Hickman called it a Sea Sled. Compared with other boats it was smoother and drier running; it was well behaved at sea; it easily held a course, resisted broaching, carried a greater load, planed faster and needed less power. On the negative side, the Sea Sled was difficult to build in wood, sensitive to loading aft and ugly. Even so, recreational models sold well and the military loved them.

In 1916 a 36-foot Sea Sled was the world's fastest cruising cabin boat at 34 mph. In 1918 a 55-footer made 55 mph with only 1,800 hp while carrying a 10,000-pound bomber. With its airplane's engines racing, the boat went fast enough to launch the plane from the rough English Channel to attack Germany.

Everything was going well for Hickman, at least until military politics, his ego and paranoia got in the way. From his notes, I eventually discovered why so little has been written about him or his boats. Apparently he was an arrogant, patronizing pain in the ass who most wished would just go away.

By the 1920s he began to entrench and stagnate, jealously patenting everything he did. His one last chance came in 1955 when Dick Fisher was looking to build a boat with his new foam-cored construction. Fisher and his designer, Ray Hunt, tested a 17-foot Sea Sled, liked it and made Hickman a deal. In typical fashion, Hickman began demanding increased concessions and control. It was finally too much for Fisher, who encouraged Hunt to take the Sea Sled design and add a center "hull" to its tunnel. Their reason of record was to eliminate propeller ventilation. More likely it was also to prevent lawsuits. The finished "cathedral" shape was revealed in 1958 as the 13-foot Boston Whaler.

Hickman never saw this final insult. With crushing legal fees and his company in receivership, he died still fighting. Where does the fault lie? I'd say somewhere between the fears of those who were less talented and Hickman's own self-destructive passion and unrealistic vision of the world.

So next time I see you outside the inlet, raise a cold one for poor Albert. May his Sea Sleds someday return.

ILLUSTRATION: TIM BOWER

BOATING (ISSN 0006-5374) (USPS 504-810), July/August 2015, Volume 88, No. 7. ©2015. *Boating* is published monthly, except July/August and November/December, by Bonnier Corporation, 460 N. Orlando Ave., Suite 200, Winter Park, FL 32789. Periodicals postage paid at Winter Park, Florida, and additional mailing offices. Authorized periodicals postage by the Post Office Department, Ottawa, Canada, and for payment in cash. POSTMASTER: Send address changes to *BOATING*, PO Box 6364, Harlan, IA 51593-1864; BGMcustserv@cdsfulfillment.com; boatingmag.com/cs. Canada Post: Publications Mail Agreement No. 40612608 Canada. Returns to be sent to IMEX Global Solutions, PO Box 25542, London, ON N6C 6B2 Canada. If the postal service alerts us that your magazine is undeliverable, we have no further obligation unless we receive a corrected address within one year.

THRILL RIDE.

EXCLUSIVELY FROM SYLVAN.

SYLVAN

RPT 2.0

CSI

EVINRUDE E-TEC

EXCLUSIVE COLOR PACKAGE

Perfectly match your S5 or S3 pontoon in Lime Green with Evinrude E-tec G2 with lime green panels available at your Sylvan dealer.

With patented Revolutionary Planing Technology (RPT) Sylvan changes everything about pontoon performance. Our exclusive tube design slices through the water with sports car handling and runabout exhilaration. The unique V-shaped tube provides increased top speed per horsepower and dramatically improved fuel efficiency. RPT is a revolution in pontoon performance. **AND IT'S ONLY FROM SYLVAN.**

sylvanmarine.com | 866-766-9698

LAUNCHING A NEW WAVE.

You've dreamed about this day. The moment that luxury performance and adrenaline-charged athleticism dance at the push of the throttle. Well, here it is... Regal's new wave of innovation - The all-new Surf Series. This unique blend of comfort and agility meets the needs of the whole family. The innovative Regal Surf System and Volvo Forward Drive provide one-touch control creating non-stop surfing and boarding action.

Contact your local dealer to demo the new Regal Surf Series and begin your new wave of summer memories.

Available Surf models: **2100 RX SURF** | **2300 RX SURF**

REGAL.

regalboats.com/surf